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ANSI A117.1 (1992), Standard for Accessible and Usable Buildings and Facilities as mandated by law and incorporated by reference by the States and Municipalities and in the Code of Federal Regulations at 24 CFR 100.201.

American National Standard

CABO/ANSI A117.1-1992

*Accessible and Usable
Buildings and Facilities*



**Council of
American
Building
Officials**

American National Standard

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A117.1-1992**

Revision of
ANSI A117.1-1986

American National Standard

Accessible and Usable Buildings and Facilities

Secretariat

Council of American Building Officials

Approved December 15, 1992

American National Standards Institute, Inc

American National Standard

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FOREWORD (This Foreword is not part of American National Standard A117.1-1992.)

The 1961 edition of ANSI Standard A117.1 presented the first criteria for accessibility to be approved as an American National Standard and was the result of research conducted by the University of Illinois under a grant from the Easter Seal Research Foundation. The National Easter Seal Society and the President's Committee on Employment of People with Disabilities became members of the Secretariat and the Standard was reaffirmed in 1971.

In 1974, the U.S. Department of Housing and Urban Development joined the Secretariat and sponsored needed research which resulted in the 1980 edition. After further revision that included a special effort to remove application criteria (scoping requirements), the 1986 edition was published and, when requested in 1987, the Council of American Building Officials (CABO) assumed the Secretariat. Central to the intent of the change in the Secretariat was the development of a standard that, when adopted as part of a building code, would be compatible with the building code and its enforcement. This edition has largely achieved that goal.

For this edition, substantial effort was devoted to removing from the Standard informational statements and application criteria (scoping requirements) such as where, when, and to what extent the criteria will apply to the built environment. In furtherance of that effort, all figures were moved to an appendix to emphasize that they are to illustrate, not establish, the criteria. The appendices are not part of the Standard; therefore, should a figure appear to illustrate criteria that differ with the text of the Standard, the criteria stated in the text govern because the figure is contained in an appendix.

Suggestions for improving this edition will be welcome. They should be sent to Council of American Building Officials, Secretariat, ANSI A117 Committee, Suite 708, 5203 Leesburg Pike, Falls Church, VA 22041.

This Standard was processed and approved for submittal to ANSI by the Accredited Standards Committee on Architectural Features and Site Design of Public Buildings and Residential Structures for Persons with Handicaps (A117). Committee approval of the Standard does not necessarily imply that all Committee members voted for its approval. At the time it approved this Standard, the A117 Committee had the following members:

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American National Standard—

Accessible and Usable Buildings and Facilities

1 Purpose and Application

1.1* Purpose

The specifications in this standard make buildings and facilities accessible to and usable by people with such physical disabilities as the inability to walk, difficulty walking, reliance on walking aids, blindness and visual impairment, deafness and hearing impairment, incoordination, reaching and manipulation disabilities, lack of stamina, difficulty interpreting and reacting to sensory information, and extremes of physical size based generally upon adult dimensions. Accessibility and usability allow a person with a physical disability to independently get to, enter and use a building or facility.

This standard provides specifications for elements that are used in making functional spaces accessible. For example, it specifies technical requirements for making doors, routes, seating, and other elements accessible. These accessible elements are used to design accessible functional spaces such as classrooms, hotel rooms, lobbies, or offices.

This standard is for adoption by government agencies and by organizations setting model codes to achieve uniformity in the technical design criteria in building codes and other regulations. This standard is also used by non-governmental parties as technical design guidelines or requirements to make buildings and facilities accessible to and usable by persons with physical disabilities.

1.2 Application

Provisions of this standard are suitable for:

- the design and construction of new buildings and facilities, including both spaces and elements, site improvements, and public walks
- remodeling, alteration, and rehabilitation of existing construction

- permanent, temporary, and emergency conditions

2 Recommendations to Adopting Authorities

2.1 Administration

This standard does not establish which occupancy or building types are covered and the extent to which each type is covered. Such requirements for application of this standard shall be specified by the adopting authority, including which and how many functional spaces and elements are to be made accessible within each building type, as described in 2.2 through 2.4.

2.2 Number of Spaces and Elements

The administrative authority adopting this standard shall specify the actual number of spaces and elements or establish procedures for determining them based on, but not limited to:

- population to be served
- availability to occupants, employees, customers, and visitors
- distances and time required to use the accessible elements
- provision of equal opportunity and treatment under law

2.3* Remodeling

The specifications in this standard are based upon the functional requirements of persons with physical disabilities. The administrative authority adopting this standard shall specify the extent to which it is to cover remodeling, alteration, or rehabilitation within its jurisdiction.

2.4 Review Procedures

To promote effective compliance with the requirements of this standard, the administrative authority adopting it should establish a review and approval

* an asterisk denotes explanatory text in Appendix A.

procedure for construction projects that come under its jurisdiction.

3 Graphics, Dimensions, Referenced Standards, and Definitions

3.1 Graphic Conventions

Graphic conventions used in the illustrations are shown in Table 3.1. Dimensions that are not marked "minimum," "maximum," or "nominal" are absolute, unless otherwise indicated in the text or captions.

3.2 Dimensions

All dimensions are subject to conventional industry tolerances. Millimeter equivalents for dimensions 3 in and larger have been rounded off to the nearest multiple of 5.

3.3 Referenced American National Standards

The following American National Standards are referenced in this document.

ANSI/BHMA A156.10-1991, Power Operated Pedestrian Doors

ANSI/BHMA A156.19-1990, Power Assist and Low Energy Power Operated Doors

ASME/ANSI A17.1-1990, Safety Code for Elevators and Escalators (including Addenda ASME/ANSI A17.1a-1991)

3.4 Definitions

For the purpose of this standard, the terms listed in 3.4 have the indicated meaning.

access aisle: An accessible pedestrian space between elements, such as parking spaces, seating, and desks, that provides clearances appropriate for use of the elements.

accessible: Describes a site, building, facility, or portion thereof that complies with this standard and that can be approached, entered, and used by persons with physical disabilities.

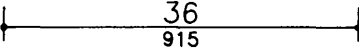
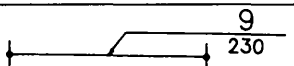
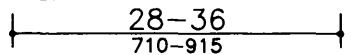
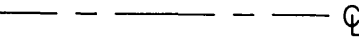
accessible route: A path connecting all accessible elements and spaces in a building or facility that is usable by persons with physical disabilities.

adaptability: The capability of certain building spaces and elements, such as kitchen counters, sinks, and grab bars, to be altered or added so as to accommodate the needs of persons with and without disabilities, or to accommodate the needs of persons with different types or degrees of disability.

adaptable dwelling unit: An accessible dwelling unit which has been designed for adaptability.

administrative authority: A jurisdictional body that adopts or enforces regulations and standards for the design, construction, or operation of buildings and facilities.

Table 3.1 – Graphic conventions

Convention	Description
	Typical dimension line showing U.S. customary units (in inches) above the line and SI units (in millimeters) below
	Dimensions for short distances indicated on arrow
	Dimension line showing range of dimensions
	Direction of approach
max	Maximum
min	Minimum
	Boundary of clear floor area
	Centerline

authority having jurisdiction: See administrative authority.

automatic door:* A door operated with power mechanisms and controls.

circulation path:* An exterior or interior way of passage from one place to another for pedestrians.

clear: Unobstructed.

common use:* Those rooms, spaces, or elements that are made available for use of a specific group of people.

counter slope: Any slope opposing the running slope of a curb ramp or ramp.

cross slope: The slope of a pedestrian way that is perpendicular to the direction of travel (see running slope).

curb ramp: A short ramp cutting through a curb or built up to it.

detectable: Perceptible by one or more of the senses.

dwelling unit:* A single unit of residence that provides a kitchen or food preparation area, in addition to rooms and spaces for living, bathing, sleeping, and the like.

egress, means of: A continuous and unobstructed way of travel from any point in a building or facility to a public way.

element:* An architectural or mechanical component of a building, facility, space or site that is used in making spaces accessible.

facility: All or any portion of a building, structure, or area, including the site on which such building, structure, or area is located, wherein specific services are provided or activities are performed.

housing:* A building, facility, or portion thereof that contains one or more dwelling units or sleeping accommodations, excluding inpatient health care facilities and detention/correctional facilities.

marked crossing: A crosswalk or other identified path intended for pedestrian use in crossing a vehicular way.

multifamily dwelling: Any building containing more than two dwelling units.

operable part:* A part of a piece of equipment or appliance used to insert or withdraw objects, or to activate, deactivate, or adjust the equipment or appliance.

parking space:* Any space for parking vehicles.

power-assisted door:* A door used for human passage, with a mechanism that helps to open the door, or to relieve the opening resistance of the door.

public use:* Describes rooms or spaces that are made available to the general public.

ramp: A walking surface that has a running slope steeper than 1:20.

running slope: The slope of a pedestrian way that is parallel to the direction of travel (see cross slope).

signage: Displayed textual, symbolic, tactile and pictorial information.

site: A parcel of land bounded by a property line or a designated portion of a public right-of-way.

site improvements:* Features added to a site.

sleeping accommodations:* Rooms intended for sleeping purposes.

tactile: Describes an object that can be perceived using the sense of touch.

telecommunications device for the deaf (TDD):* Machinery or equipment that employs interactive graphic communications through the transmission of coded signals across the standard telephone network.

temporary:* Applies to facilities that are not of permanent construction but are extensively used or essential for public use for a given (short) period of time.

vehicular way:* A route provided for vehicular traffic.

walk:* An exterior pathway with a prepared surface for pedestrian use.

4. Accessible Elements and Spaces

4.1 Basic Components

Accessible sites, facilities, and buildings, including public-use, employee-use, and common-use spaces in housing facilities, shall, where required, provide accessible elements and spaces conforming with Section 4.

4.2 Space Allowances and Reach Ranges

4.2.1* Wheelchair Passage Width. The clear width of a passageway for a single wheelchair

shall be 32 in (815 mm) minimum for a passageway length of 24 in (610 mm) maximum and 36 in (915 mm) minimum for a passageway longer than 24 in (610 mm). See Fig. B4.2.1.

4.2.2 Width for Wheelchair Passing. The width for two wheelchairs to pass shall be 60 in (1525 mm) minimum. See Fig. B4.2.2.

4.2.3* Wheelchair Turning Space. The space required for a wheelchair to make a 180-degree turn shall be a clear space of 60 in (1525 mm) diameter minimum or a T-shaped space within a 60 in (1525 mm) minimum square with arms 36 in (915 mm) wide minimum and 60 in (1525 mm) long minimum. See Fig. B4.2.3. Wheelchair turning space shall be permitted to include knee and toe clearance in accordance with 4.2.4.3.

4.2.4* Clear Floor or Ground Space for Wheelchairs

4.2.4.1 Size. The clear floor or ground space required to accommodate a single, stationary wheelchair and occupant shall be 30 in by 48 in (760 mm by 1220 mm) minimum. See Fig. B4.2.4.1.

4.2.4.2 Approach. The minimum clear floor or ground space for wheelchairs shall be positioned for either forward or parallel approach to an object. See Fig. B4.2.4.2.

4.2.4.3 Knee and Toe Clearances. Knee clearance shall be 25 in (635 mm) in depth maximum, 30 in (760 mm) wide minimum, and 27 in (685 mm) high minimum. Toe clearance shall be 6 in (150 mm) deep maximum and 9 in (230 mm) high minimum.

4.2.4.4 Relationship of Maneuvering Clearance to Wheelchair Spaces. One full unobstructed side of the clear floor or ground space for a wheelchair shall adjoin or overlap an accessible route or adjoin another wheelchair clear floor space. If a clear

floor space is located in an alcove or otherwise confined on all or part of three sides, additional maneuvering clearances shall be provided as follows:

- forward approach. The width of an alcove shall be 36 in (915 mm) minimum when the depth exceeds 10 in (255 mm). See Fig. B4.2.4.4.

- parallel approach. The length of an alcove shall be 60 in (1525 mm) minimum when the depth exceeds 10 in (255 mm). See Fig. B4.2.4.4.

4.2.4.5 Surfaces of Wheelchair Spaces. Clear floor or ground spaces for wheelchairs shall comply with 4.5.

4.2.5 Forward Reach

4.2.5.1 Unobstructed. If the clear floor space allows only forward approach to an object and is unobstructed, the high forward reach permitted shall be 48 in (1220 mm) maximum and the low forward reach shall be 15 in (380 mm) minimum above the floor. See Fig. B4.2.5.1.

4.2.5.2 Obstructed. If the high forward reach is over an obstruction, reach depth and heights shall comply with Table 4.2.5.2. See Fig. B4.2.5.2.

4.2.6* Side Reach

4.2.6.1 Unobstructed. If the clear floor space allows a parallel approach by a person in a wheelchair, the high side reach permitted shall be 54 in (1370 mm) maximum and the low side reach shall be 15 in (380 mm) minimum above the floor. See Fig. B4.2.6.1

4.2.6.2 Obstructed. If the side reach is over an obstruction, the high reach shall be 46 in (1170 mm) maximum providing:

Table 4.2.5.2 – Reach limits for obstructed forward reach¹⁾

	in	mm	in	mm
Reach depth	0 – <20	0 – <510	20 – 25	510 – 635
Reach height	48	1220	44	1120

¹⁾ The clear floor space extending under an obstruction shall be equal to or greater than the reach depth for a maximum of 25 in (635 mm).

- the height of the obstruction from the floor or ground is 34 in (865 mm) maximum, and
- the depth of the obstruction is 24 in (610 mm) maximum. See Fig. B4.2.6.2.

4.3 Accessible Route

4.3.1* General. Accessible routes shall comply with 4.3.

4.3.2 Components

4.3.2.1 Accessible routes shall consist of one or more of the following components: Walking surfaces with a slope not steeper than 1:20, marked crossings at vehicular ways, clear floor space at accessible elements, access aisles, ramps, curb ramps and elevators.

4.3.2.2 All components of an accessible route shall comply with the applicable portions of this standard.

4.3.3* Width. Clear width of an accessible route shall be 36 in (915 mm) minimum, except at doors (see 4.13.5). See Fig. B4.3.3(a). Clear width of the accessible route with turns around an obstruction less than 48 in (1220 mm) wide shall have a clear space of 42 in by 48 in (1065 mm by 1220 mm) minimum. See Fig 4.3.3(b).

4.3.4* Passing Space. An accessible route with a clear width less than 60 in (1525 mm) shall provide passing spaces at intervals of 200 ft (61 m) maximum. These passing spaces shall be either a 60 in by 60 in (1525 mm by 1525 mm) minimum space, or an intersection of two corridors or walks which provide a T-shaped turning space complying with 4.2.3.

4.3.5 Surface Texture. Surface textures of an accessible route shall comply with 4.5.

4.3.6 Slope. Portions of an accessible route with running slopes steeper than 1:20 are ramps and shall comply with 4.8. The cross slope of an accessible route shall not be steeper than 1:48.

4.3.7 Changes in Level. Changes in level along an accessible route shall comply with 4.5.2.

4.3.8 Doors. Doors that are part of an accessible route shall comply with 4.13.

4.3.9* Egress. Accessible routes serving any accessible space or element shall also serve as a means of egress for emergencies or connect to an accessible area of refuge.

4.3.10* Handrails. Handrails for stairs and ramps shall comply with 4.3.10.

4.3.10.1 Handrails shall be provided on both sides of stairs and ramps.

Exception: Aisle stairs and aisle ramps provided with a handrail either at the side or within the aisle width.

4.3.10.2 Handrails shall be continuous within the full length of each stair flight or ramp run.

Exception: Handrails in aisles serving seating.

4.3.10.3 Inside handrails on switchback or dogleg stairs or ramps shall be continuous between flights or runs. See Fig. B4.3.10.3. Other handrails shall comply with 4.3.11 and 4.4.

Exception: Handrails in aisles serving seating.

4.3.10.4 Top of gripping surfaces of handrails shall be 34 in (865 mm) minimum and 38 in (965 mm) maximum vertically above stair nosings and ramp surfaces. Handrails shall be at a consistent height above stair nosings and ramp surfaces.

4.3.10.5 Clear space between handrail and wall shall be 1 1/2 in (38 mm) minimum.

4.3.10.6 Gripping surfaces shall be continuous, without interruption by newel posts, other construction elements, or obstructions.

4.3.10.7 Handrails shall have a circular cross section with an outside diameter of 1 1/4 in (32 mm) minimum and 2 in (51 mm) maximum, or shall provide equivalent graspability in accordance with the following requirement. Handrails with other shapes shall be permitted provided they have a perimeter dimension of 4 in (100 mm) minimum and 6 1/4 in (160 mm) maximum, and provided their largest cross-section dimension is 2 1/4 in (57 mm) maximum.

4.3.10.8 Handrails, and any wall or other surfaces adjacent to them, shall be free of any sharp or abrasive elements. Edges shall have 1/8 in (3.2 mm) minimum radius.

4.3.10.9 Handrails shall not rotate within their fittings.

4.3.11* Handrail Extensions. Handrails for stairs and ramps shall have extensions complying with 4.3.11.

Exception: Continuous handrails at the inside turn of stairs and ramps.

4.3.11.1 Ramp handrails shall extend horizontally 12 in (305 mm) minimum beyond the top and bottom of ramp runs. Such extension shall return to a wall, guard or the walking surface, or shall be continuous to the handrail of an adjacent ramp run. See Fig. B4.3.11.1.

4.3.11.2 At the top of a stair flight, handrails shall extend horizontally above the landing for 12 in (305 mm) minimum beginning directly above the first riser nosing. Such extension shall return to a wall, guard or the walking surface, or shall be continuous to the handrail of an adjacent stair flight. See Fig. B4.3.11.2.

4.3.11.3 At the bottom of a stair flight, handrails shall extend at the slope of the stair flight for a horizontal distance equal to one tread depth beyond the last riser nosing. Such extension shall continue with a horizontal extension complying with 4.3.11.4 or shall return to a wall, guard or the walking surface. See Fig. B4.3.11.3.

4.3.11.4 At the bottom of a stair flight, where a guard or wall is located so as to permit a 12 in (305 mm) minimum horizontal extension of the handrail, in addition to the extension required by 4.3.11.3, such a 12 in (305 mm) minimum extension shall be provided. The height of this extension shall equal the height of the handrail above the stair nosing. Such extension shall return to a wall, guard or the walking surface, or shall be continuous to the handrail of an adjacent stair flight. See Fig. B4.3.11.4.

4.4* Protruding Objects

Protruding objects shall comply with 4.4.

4.4.1 Objects with leading edges located more than 27 in and not more than 80 in (685 mm and 2030 mm) above the floor shall protrude from the wall 4 in (100 mm) maximum. See Fig. B4.4(a).

4.4.2 The protrusion of objects with leading edges located 27 in (685 mm) or less above the floor shall not be limited. See Fig. B4.4(a).

4.4.3 Free-standing objects mounted on posts or pylons shall be permitted to overhang 12 in (305 mm) maximum when located more than 27 in (685 mm) and not more than 80 in (2030 mm) above the ground or floor. See Fig. B4.4(b). Where a sign or other obstruction is mounted between posts or pylons and the clear distance between the posts or pylons is greater than 12 in (305 mm), the lowest edge of such sign or obstruction shall be either 27

in (685 mm) maximum or 80 in (2030 mm) minimum above the adjacent ground or floor surface. See Fig. B4.4(c).

4.4.4 Guardrails or other barriers shall be provided when vertical clearance of an area adjoining an accessible route is less than 80 in (2030 mm) high. Leading edge of such guardrail or barrier shall be located 27 in (685 mm) maximum above the floor. See Fig. B4.4(c) and (d).

4.4.5 Protruding objects shall not reduce the clear width required for accessible routes. See Fig. B4.4(e).

4.5 Ground and Floor Surfaces

4.5.1* General. Ground and floor surfaces of accessible routes and in accessible rooms and spaces, shall be stable, firm, and slip resistant, and shall comply with 4.5.

4.5.2* Changes in Level.

4.5.2.1 Changes in level of 1/4 in (6 mm) high maximum shall be permitted to be vertical and without edge treatment. See Fig. B4.5(a).

4.5.2.2 Changes in level between 1/4 in (6 mm) high minimum and 1/2 in (13 mm) high maximum shall be beveled with a slope not steeper than 1:2. See Fig. B4.5(b).

4.5.2.3 Changes in level greater than 1/2 in (13 mm) shall be accomplished by a curb ramp, ramp or elevator that complies with 4.7, 4.8 or 4.10, respectively.

4.5.3* Carpet. Carpet or carpet tile used on a ground or floor surface shall be securely attached and shall have a firm cushion, pad, or backing or no cushion or pad. Carpet or carpet tile shall have a level loop, textured loop, level cut pile, or level cut/uncut pile texture. Pile height shall be 1/2 in (13 mm) maximum. Exposed edges of carpet shall be fastened to floor surfaces and shall have trim along the entire length of the exposed edge. Carpet edge trim shall comply with 4.5.2.

4.5.4. Gratings. Gratings located in accessible routes and spaces shall have openings no greater than 1/2 in (13 mm) wide in one direction. Gratings with elongated openings shall be placed so that the long dimension is perpendicular to the dominant direction of travel.

4.6 Parking Spaces and Passenger Loading Zones

4.6.1* General. Accessible parking spaces shall comply with 4.6.2. Accessible passenger loading zones shall comply with 4.6.3. Accessible parking spaces, access aisles and passenger loading zones shall have surface slopes not steeper than 1:48 in all directions. Access aisles serving accessible parking spaces or passenger loading zones shall be at the same level as the spaces or loading zones they serve.

4.6.2* Parking Spaces. Parking spaces for persons with disabilities shall be 96 in (2440 mm) wide minimum and shall have an adjacent access aisle 60 in (1525 mm) wide minimum. See Fig. B4.6.2. Parking access aisles shall be part of the accessible route to the building or facility entrance and shall comply with 4.3. Two accessible parking spaces shall be permitted to share a common access aisle. Parked vehicle overhangs shall not reduce the clear width of an accessible circulation route.

Accessible parking spaces shall be identified by a sign showing the international symbol of accessibility complying with 4.28.8. Signs shall not be obscured by a vehicle parked in the space.

4.6.3 Passenger Loading Zones. Passenger loading zones shall provide an access aisle 60 in (1525 mm) wide minimum and 20 ft (6 m) long minimum adjacent and parallel to the vehicle pull-up space and at the same level as the roadway. See Fig. B4.6.3. Access aisle and vehicle pull-up space shall be at the same level with a slope not steeper than 1:48. Passenger loading zone access aisles shall be part of the accessible route of travel to the building or facility entrance and shall comply with 4.3.

Vertical clearance of 114 in (2895 mm) minimum shall be provided at accessible passenger loading zones and along vehicle access routes to such areas from site entrances.

4.6.4* Van Parking Space. Accessible parking spaces for vans used by persons with disabilities shall have a height of 98 in (2490 mm) minimum at the space and along the vehicular route thereto and shall have an access aisle 96 in (2440 mm) wide minimum.

4.7 Curb Ramps

4.7.1 Location. Curb ramps complying with 4.7 shall be provided wherever an accessible route

crosses a curb.

4.7.2 Slope. Slopes of curb ramps shall comply with 4.8.2. The slope shall be measured as the vertical rise relative to the horizontal run. See Fig. B4.7.2. Counter slopes of adjoining gutters and road surfaces immediately adjacent to the curb ramp or accessible route shall not be steeper than 1:20. Transitions from ramps to walks, gutters or streets shall be flush.

4.7.3 Width. Curb ramps shall be 36 in (915 mm) wide minimum, exclusive of flared sides.

4.7.4 Surface. Surfaces of curb ramps shall comply with 4.5.

4.7.5 Sides of Curb Ramps. Curb ramps located where pedestrians must walk across the ramp shall have flared sides. Slope of flares shall not be steeper than 1:10. See Fig. B4.7.5(a). Where the width of the walking surface at the top of the ramp and parallel to the run of the ramp is less than 48 in (1220 mm) wide, the flared sides shall have a slope not steeper than 1:12. Curb ramps with returned curbs shall be permitted where pedestrians would not normally walk across the ramp. See Fig. B4.7.5(b).

4.7.6 Built-Up Curb Ramps. Built-up curb ramps shall be located so that they do not protrude into vehicular traffic lanes or into parking space access aisles. Flare shall not be steeper than 1:10. See Fig. B4.7.6.

4.7.7 Obstructions. Curb ramps shall be located or protected to prevent their obstruction by parked vehicles.

4.7.8 Handrails. Handrails are not required on curb ramps.

4.7.9 Location at Marked Crossings. Curb ramps at marked crossing shall be wholly contained within the markings, excluding any flared sides. See Fig. B4.7.9.

4.7.10 Diagonal Curb Ramps. Diagonal (or corner-type) curb ramps with returned curbs or other well-defined edges shall have the edges parallel to the direction of pedestrian flow. Bottoms of diagonal curb ramps shall have 48 in (1220 mm) minimum clear space. See Fig. B4.7.9(c) and (d). Diagonal curb ramps provided at marked crossings shall provide the 48 in (1220 mm) minimum clear space within the markings. See Fig. B4.7.9(c) and (d). Diagonal curb ramps with flared sides shall have a segment of straight curb 24 in (610

mm) long minimum located on each side of the curb ramp and within the marked crossing. See Fig. B4.7.9(c).

4.7.11 Islands. Raised islands in crossings shall be cut through level with the street or have curb ramps at both sides, and a level area 48 in (1220 mm) long minimum by 36 in (915 mm) wide minimum, in the part of the island intersected by the crossing. See Fig. B4.7.9(a) and (b).

4.8 Ramps

4.8.1* General. A slope steeper than 1:20 shall be considered a ramp and shall comply with 4.8.

4.8.2* Slope and Rise. Ramps in new construction shall have a slope not steeper than 1:12. The rise for any ramp run shall be 30 in (760 mm) maximum. See Fig. B4.8.2. Curb ramps and ramps constructed on existing sites or existing buildings or facilities shall be permitted to have slopes and rises as shown in Table 4.8.2 provided space limitations prohibit use of a 1:12 slope or less.

4.8.3 Clear Width. The clear width of a ramp shall be 36 in (915 mm) minimum. See Fig. B4.8.3.

4.8.4 Landings. Ramps shall have level landings at bottom and top of each run. Landings shall have the following features:

- landing width shall be at least as wide as the widest ramp run leading to it.
- landing length shall be 60 in (1525 mm) minimum clear.
- ramps that change direction at landings shall have a 60 in by 60 in (1525 mm by 1525 mm) minimum landing.
- doorways located at a landing shall have an area in front of the doorway which shall comply with 4.13.6.

4.8.5 Handrails. Ramps with a rise greater than 6 in (150 mm) or a run greater than 72 in (1830 mm) shall have handrails complying with 4.3.10 and 4.3.11.

4.8.6* Cross Slope and Surfaces. Cross slope of ramp surfaces shall not be steeper than 1:48. Ramp surfaces shall comply with 4.5.

4.8.7 Edge Protection. Ramps and landings shall have curbs, walls, or railings that prevent people from traveling off the ramp or landing or shall protrude 12 in (305 mm) minimum beyond the inside face of the railing. Curbs or barriers shall be 4 in (100 mm) high minimum. See Fig. B4.8.3.

4.8.8 Outdoor Conditions. Outdoor ramps and approaches to them shall be designed so that water will not accumulate on walking surfaces.

4.9 Stairs

4.9.1 General. Accessible stairs shall comply with 4.9.

4.9.2 Treads and Risers

4.9.2.1 Dimensions. All steps on a flight of stairs shall have uniform riser heights and uniform tread depth. Risers shall be 7 in (180 mm) maximum and 4 in (100 mm) high minimum. Treads shall be 11 in (280 mm) deep minimum, measured from riser to riser. See Fig. B4.9.2.1.

4.9.2.2 Open Risers. Open risers are not permitted.

4.9.3 Nosings. Undersides of nosings shall not be abrupt. The radius of curvature at the leading edge of tread shall be 1/2 in (13 mm) maximum. Risers shall be sloped or the underside of the nosing shall have an angle of 60 degrees minimum from the horizontal. Nosings shall protrude 1 1/2 in (38 mm) maximum. See Fig. B4.9.2.1.

4.9.4 Handrails. Stairs shall have handrails complying with 4.3.10 and 4.3.11.

Table 4.8.2 – Allowable ramp dimensions for construction in existing sites, buildings and facilities

Slope ¹⁾	Maximum Rise	
Steeper than 1:10 but not steeper than 1:8	3 in	75 mm
Steeper than 1:12 but not steeper than 1:10	6 in	150 mm
¹⁾ A slope steeper than 1:8 shall not be permitted.		

4.9.5 Outdoor Conditions. Outdoor stairs and approaches to them shall be designed so that water will not accumulate on walking surfaces.

4.10 Elevators

4.10.1 New Elevators

4.10.1.1 General. Accessible passenger elevators shall comply with 4.10 and ASME/ANSI A17.1. Freight elevators shall not be considered as meeting the requirements of this section unless the only elevators provided are used as combination passenger and freight elevators.

4.10.1.2 Automatic Operations. Elevator operation shall be automatic. Each car shall be equipped with a self-leveling feature that will automatically bring the car to floor landings within a tolerance of 1/2 in (13 mm) under rated loading to zero loading conditions. This self-leveling feature shall be automatic and independent of the operable part and shall correct for overtravel or undertravel.

4.10.1.3 Call Buttons. Call buttons in elevator lobbies and halls shall be centered at 42 in (1065 mm) above the floor. See Fig. B4.10.1. Such call buttons shall have visual signals to indicate when each call is registered and when each call is answered. Call buttons shall be 3/4 in (19 mm) minimum in the smallest dimension. The button that designates the up direction shall be located above the button that designates the down direction. Objects located beneath hall call buttons shall protrude into the elevator lobby 4 in (100 mm) maximum.

4.10.1.4 Hall Signals. A visible and audible signal shall be provided at each hoistway entrance to indicate which car is answering a call and the direction of travel, except that in-car signals located in cars, visible from the floor area adjacent to the hall call buttons, and conforming to the requirements of this subsection, shall be acceptable. Audible signals shall sound once for the up direction and twice for the down direction, or shall have verbal annunciators that state the word "up" or "down." Visible signals shall have the following features:

- Hall signal fixtures shall be centered at 72 in (1830 mm) minimum above the lobby floor. See Fig. B4.10.1.
- The visible signal elements shall be 2 1/2 in (63 mm) minimum in the smallest dimension.
- Signals shall be visible from the floor area adjacent to the hall call button.

4.10.1.5* Tactile Signage on Hoistway Entrances. Raised character and Braille floor designations shall be provided on both jambs of elevator hoistway entrances and shall be centered at 60 in (1525 mm) above the floor. See Fig. B4.10.1. Such characters shall be 2 in (51 mm) high nominal and shall comply with 4.28.6.

4.10.1.6* Door Protective and Reopening Device. Elevator doors shall open and close automatically. Elevator doors shall be provided with a reopening device that shall stop and reopen a car door and hoistway door automatically if the door becomes obstructed by an object or person. The device shall be activated by sensing an obstruction passing through the door opening at 5 in and at 29 in (125 mm and 735 mm) above the floor. The device shall not require physical contact to be activated, although contact may occur before the door reverses. Door reopening devices shall remain effective for 20 seconds minimum.

4.10.1.7* Door and Signal Timing for Hall Calls. The minimum acceptable time from notification that a car is answering a call until the doors of that car start to close shall be calculated from one of the following equations:

$$T = \frac{D}{1.5 \text{ ft/s}}$$

or

$$T = \frac{D}{455 \text{ mm/s}} = 5 \text{ seconds minimum}$$

where T = total time in seconds and D = distance (in feet or millimeters) from the point in the lobby or corridor 60 in (1525 mm) directly in front of the farthest call button controlling that car to the centerline of its hoistway door.

For cars with in-car signals, T begins when the signal is visible from the point 60 in (1525 mm) directly in front of the farthest hall call button and the audible signal is sounded.

4.10.1.8 Door Delay for Car Calls. Elevator doors shall remain fully open in response to a car call for 3 seconds minimum.

4.10.1.9* Inside Dimensions of Elevator Cars. The inside dimensions of elevator cars shall provide space for wheelchair users to enter the car, maneuver within reach of controls, and exit from the car. The clearance between the car platform sill and the edge of any hoistway landing shall be 1 1/4 in (32 mm) maximum.

4.10.1.10 Floor Surfaces. Floor surfaces in elevator cars shall comply with 4.5.

4.10.1.11 Illumination Levels. The level of illumination at the car controls, platform, and car threshold and landing sill shall be 5 footcandles (53.8 lux) minimum.

4.10.1.12* Car Controls. Elevator control panels shall have the following features:

4.10.1.12.1. Control buttons shall be 3/4 in (19 mm) minimum in their smallest dimension. Control buttons shall be raised, flush, or recessed.

Control buttons shall be arranged with numbers in ascending order. When two or more columns of buttons are provided they shall read from left to right. See Fig. B4.10.1.12(a).

4.10.1.12.2 Designations for control buttons shall comply with 4.28.2, 4.28.5 and 4.28.6. The call button for the main entry floor shall be designated by a star. Raised and Braille designations for control buttons shall be placed immediately to the left of the button to which the designations apply. See Fig. B4.10.1.12(b). Floor buttons shall be provided with visible indicators to show that a call has been registered. The visible indication shall cease when the call has been answered.

4.10.1.12.3 Floor buttons shall be located 54 in (1370 mm) maximum above the floor for parallel approach and 48 in (1220 mm) maximum for front approach. Emergency controls, including the emergency alarm, shall be grouped at the bottom of the panel. Emergency control buttons shall have their centerlines 35 in (890 mm) minimum above the floor. See Fig. B4.10.1.12(c).

4.10.1.12.4 Controls shall be located on a front wall if cars have center opening doors, and at the side wall or at the front wall next to the door if cars have side opening doors.

4.10.1.13* Car Position Indicators. In elevator cars, both audible and visible car floor location indicators shall be provided.

4.10.1.13.1 Visible. Indicator shall be located above the car control panel or above the door. Numerals shall be 1/2 in (13 mm) minimum. As the car passes or stops at a floor served by the elevator, the corresponding character shall illuminate.

4.10.1.13.2 Audible. Indicator shall be 20 decibels minimum with a frequency of 1500 Hz maximum above ambient. Indicator shall be either an audible signal which sounds when the car passes a floor

and when a car stops at a floor served by the elevator, or an automatic verbal announcement which announces the floor at which the car has stopped.

4.10.1.14* Emergency Communications. If provided, car emergency signaling devices between the elevator and a point outside the hoistway shall comply with ASME/ANSI A17.1. The highest operable part of a two-way communication system shall be 54 in (1370 mm) maximum above the floor for parallel approach and 48 in (1220 mm) maximum above the floor for front approach. If the device is located in a closed compartment, the compartment door hardware shall comply with 4.25. The device shall be identified by raised symbols and lettering complying with 4.28 and located adjacent to the device. If the system uses a handset, the cord from the panel to the handset shall be 29 in (735 mm) long minimum. The car emergency signaling device shall not be limited to voice communication. If instructions for use are provided, essential information shall be presented in both tactile and visual form.

4.10.2 Existing Elevators

4.10.2.1 General. Existing passenger elevators that are required to be accessible shall comply with 4.10.2 and with 4.10.1.2, 4.10.1.5, 4.10.1.7 through 4.10.1.11, and 4.10.1.14. All elevators that are programmed to respond to the same hall call control as the required accessible elevator shall comply with the requirements of 4.10.2.

4.10.2.2 Call Buttons. The top of the hall call buttons shall be located vertically between 35 in (890 mm) and 54 in (1370 mm) above the floor when the appropriate floor area specified in 4.2.5 or 4.2.6 is provided. The button that designates the up direction shall be located above the button that designates the down direction.

4.10.2.3 Hall Signals. A visible and audible signal shall be provided at each hoistway entrance to indicate which car is answering a call, except that in-car signals complying with 4.10.1.4 shall be acceptable. Audible signals shall sound once for the up direction and twice for the down direction, or shall have verbal annunciators that state the word "up" or "down." If hall signals are added, they shall comply with 4.10.1.4.

4.10.2.4 Door Operation. Power operated horizontally sliding car and hoistway doors opened and closed by automatic means shall comply with 4.10.1.6. Existing manually operated hoistway swing doors shall comply with 4.13.5 and 4.13.11.

A power operated car door that opens and maintains a 32 in (815 mm) minimum clear width shall be provided. Closing of the car door shall not be initiated until the hoistway door is closed. Car gates are prohibited.

4.10.2.5 Car Controls. Elevator control panels shall have the following features:

4.10.2.5.1 Car control buttons shall be 3/4 in (19 mm) minimum in their smallest dimension. Control buttons shall be raised, flush or recessed.

4.10.2.5.2 When the car operating panel is changed, control buttons shall comply with 4.10.1.12.1.

4.10.2.5.3 All control buttons shall comply with 4.10.1.12.2.

Exception: When existing car operating panel construction precludes locating tactile markings to the left of the controls, markings shall be placed as near to the control as possible.

4.10.2.5.4 All floor buttons shall be located 54 in (1370 mm) maximum above the floor for parallel approach and 48 in (1220) maximum above the floor for front approach. When the panel is changed, emergency controls, including the emergency alarm, shall comply with 4.10.1.12.3.

4.10.2.5.5 Location of controls shall comply with 4.10.1.12.4.

4.10.2.5.6 When a new car operating panel conforming to the requirements of 4.10.1.12 is provided, existing car operating panel(s) not conforming to 4.10.1.12 are not required to be removed.

4.10.2.6 Car Position Indicators. When a new car position indicator is installed, the indicator shall comply with 4.10.1.13.

4.10.2.7 Identification. Elevators that comply with this standard shall be clearly identified with the international symbol of accessibility, unless all elevators in the building are accessible. See Fig. 4.28.8.1.

4.11 Wheelchair Lifts

Wheelchair lifts, if provided, shall comply with ASME/ANSI A17.1 and with 4.2.4, 4.5, and 4.25. Wheelchair lifts shall not require an attendant for operation.

4.12 Windows*

Windows that are required to be operable by occupants in accessible spaces shall have locks,

cranks and other window hardware that comply with 4.25.

4.13 Doors

4.13.1 General. Accessible doors shall comply with the requirements of 4.13.

4.13.2 Revolving Doors and Turnstiles. Accessible revolving doors or turnstiles shall comply with 4.13.

4.13.3 Gates. Gates, including ticket gates, shall comply with 4.13.

4.13.4. Double-Leaf Doorways. At least one of the active leaves of doorways with two independently operated leaves serving non-storage areas shall comply with 4.13.5 and 4.13.6.

4.13.5 Clear Width. Doorways shall have a clear opening of 32 in (815 mm) minimum with door open 90 degrees. Clear opening shall be measured between the face of door and stop. See Fig. B4.13.5. Openings more than 24 in (610 mm) deep shall comply with 4.2.1 and 4.3.3.

4.13.6 Maneuvering Clearances at Doors. Minimum maneuvering clearances shall comply with 4.13.6.

4.13.6.1 Front approaches to pull side of swinging doors shall have maneuvering space that extends 18 in (455 mm) minimum beyond the latch side of the door and 60 in (1525 mm) minimum perpendicular to the doorway. See Fig. B4.13.6(a).

4.13.6.2 Front approaches to push side of swinging doors, equipped with both closer and latch, shall have maneuvering space that extends 12 in (305 mm) minimum beyond the latch side of the door and 48 in (1220 mm) minimum perpendicular to the doorway. See Fig. B4.13.6(a).

4.13.6.3 Front approaches to push side of swinging doors, not equipped with latch and closer, shall have maneuvering space that is the same width as door opening and extends 48 in (1220 mm) minimum perpendicular to the doorway. See Fig. B4.13.6(a).

4.13.6.4 Hinge-side approaches to pull side of swinging doors shall have maneuvering space that extends 36 in (915 mm) minimum beyond the latch side of the door if 60 in (1525 mm) minimum is provided perpendicular to the doorway, or shall have maneuvering space that extends 42 in (1065 mm) minimum beyond the latch side of the door if 54 in (1370 mm) minimum is provided perpendicular to the doorway. See Fig. B4.13.6(b).

4.13.6.5 Hinge-side approaches to push side of swinging doors, not equipped with both latch and closer, shall have a maneuvering space of 54 in (1370 mm) minimum, parallel to the doorway and 42 in (1065 mm) minimum, perpendicular to the doorway. See Fig. B4.13.6(b).

4.13.6.6 Hinge-side approaches to push side of swinging doors, equipped with both latch and closer, shall have maneuvering space of 54 in (1370 mm) minimum, parallel to the doorway and 48 in (1220 mm) minimum perpendicular to the doorway. See Fig. B4.13.6(b).

4.13.6.7 Latch-side approaches to pull side of swinging doors, with closers, shall have maneuvering space that extends 24 in (610 mm) minimum beyond the latch side of the door and 54 in (1370 mm) minimum perpendicular to the doorway. See Fig. B4.13.6(c).

4.13.6.8 Latch-side approaches to pull side of swinging doors, not equipped with closers, shall have maneuvering space that extends 24 in (610 mm) minimum beyond the latch side of the door and 48 in (1220 mm) minimum perpendicular to the doorway. See Fig. B4.13.6(c).

4.13.6.9 Latch-side approaches to push side of swinging doors, with closers, shall have maneuvering space that extends 24 in (610 mm) minimum parallel to the doorway beyond the latch side of the door and 48 in (1220 mm) minimum perpendicular to the doorway. See Fig. B4.13.6(c).

4.13.6.10 Latch-side approaches to push side of swinging doors, not equipped with closers, shall have maneuvering space that extends 24 in (610 mm) minimum parallel to the doorway beyond the latch side of the door and 42 in (1065 mm) minimum perpendicular to the doorway. See Fig. B4.13.6(c).

4.13.6.11 Front approaches to sliding doors and folding doors shall have maneuvering space that is the same width as the door opening and shall extend 48 in (1220 mm) minimum perpendicular to the doorway. See Fig. B4.13.6(d).

4.13.6.12 Slide-side approaches to sliding doors and folding doors shall have a maneuvering space of 54 in (1370 mm) minimum, parallel to the doorway, and 42 in (1065 mm) minimum, perpendicular to the doorway. See Fig. B4.13.6(e).

4.13.6.13 Latch-side approaches to sliding doors and folding doors shall have a maneuvering space that extends 24 in (610 mm) minimum beyond the

latch side of the door and extends 42 in (1065 mm) minimum perpendicular to the doorway. See Fig. B4.13.6(f).

4.13.6.14 Doors in alcoves shall comply with 4.13.6.1, 4.13.6.2 and 4.13.6.7, clearances for front approach.

4.13.6.15 Floor or ground surface within the required maneuvering spaces shall have a slope not steeper than 1:48 and shall be clear.

4.13.6.16 Doors to hospital bedrooms shall be exempt from the requirement for space at the latch side of door provided the door is 44 in (1120 mm) wide minimum.

4.13.7 Two Doors in Series. Space between two hinged or pivoted doors in series shall be 48 in (1220 mm) minimum plus the width of any door swinging into the space. Doors in series shall swing either in same direction or away from space between doors. See Fig. B4.13.7.

4.13.8* Thresholds at Doorways. Thresholds, if provided, at doorways shall be 1/2 in (13 mm) high maximum except that thresholds for exterior residential sliding doors shall be 3/4 in (19 mm) high maximum. Raised thresholds and floor level changes shall comply with 4.5.2.

4.13.9* Door Hardware. Handles, pulls, latches, locks, and other operable parts on accessible doors shall have a shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist to operate. Such hardware shall be mounted within reach ranges specified in 4.2. When sliding doors are in the fully open position, operating hardware shall be exposed and usable from both sides.

4.13.10* Door Closers. Door closers shall be adjusted so that from an open position of 90 degrees, the time required to move the door to an open position of 12 degrees will be 5 seconds minimum.

4.13.11* Door-Opening Force. Fire doors shall have the minimum opening force allowable by the appropriate administrative authority. The required force for pushing open or pulling open doors other than fire doors shall be as follows:

- interior hinged door: 5.0 lb (22.2 N) maximum
- sliding/folding door: 5.0 lb (22.2 N) maximum

These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position.

4.13.12 Automatic Doors. Automatic doors shall comply with ANSI/BHMA A156.10.

4.13.13 Power-Assisted Doors and Low-Energy Power-Operated Doors. Power-assisted doors shall comply with ANSI/BHMA A156.19. The time required for such doors to open to the back check position shall be 3 seconds minimum. The force required to stop door movement shall be 15 lb (66.6 N) maximum.

4.13.14* Door Surface. The bottom 12 in (305 mm) of all doors except automatic doors, power assisted doors, and sliding doors shall have a smooth uninterrupted surface to allow the door to be opened by a wheelchair footrest without creating a trap or hazardous condition. When narrow stile and rail doors are used, a 12 in (305 mm) high minimum, smooth panel, extending the full width of the door, shall be installed on the push side(s) of the door which will allow the door to be opened by a wheelchair footrest without creating a trap or hazardous condition. Cavities created by kick plates shall be capped.

4.14 Entrances

Accessible entrances to a building or facility shall comply with 4.3. They shall be connected by an accessible route to all accessible spaces or elements within the building or facility.

4.15 Drinking Fountains and Water Coolers

4.15.1* General. When fixed, accessible drinking fountains and water coolers shall comply with 4.4 and 4.15.

4.15.2 Spouts.

4.15.2.1* Height. Spout outlets shall be 36 in (915 mm) maximum above the floor. See Fig. B4.15.2.1.

4.15.2.2* Location. Spouts of drinking fountains and water coolers arranged for parallel approach shall be located 3 in (75 mm) maximum from the front edge. Spouts of cantilevered drinking fountains and water coolers with knee and toe clearances, shall be located 15 in (380 mm) minimum from the vertical support and 5 in (125 mm) maximum from the front edge.

4.15.2.3 Flow. Spouts shall provide a flow of water 4 in (100 mm) high minimum so as to allow the insertion of a cup or glass under the flow of water. Measured horizontally, relative to the front face of the unit, the angle of the water stream from spouts located within 3 in (75 mm) of the front of the unit

shall be 30 degrees maximum and spouts located between 3 in and 5 in (75 mm and 125 mm) from the front shall be 15 degrees maximum. See Fig. B4.15.2.3.

4.15.3 Operable Parts. Operable parts shall be located at or near the front edge of the fountain or water cooler and shall comply with 4.25.4.

4.15.4 Clearances

4.15.4.1 Knee and Toe Clearances. Wall-mounted or post-mounted cantilevered units shall extend 17 in (430 mm) minimum from the vertical support. Clear knee space shall be provided in accordance with 4.2.4.3. The clear knee space shall be 8 in (205 mm) in depth minimum at 27 in (685 mm) minimum above the floor or ground, and 11 in (280 mm) in depth minimum at 9 in (230 mm) minimum above the floor or ground. Clear toe space shall be provided in accordance with 4.2.4.3. See Fig. B4.15.2.1.

Where the basin and spout assembly is supported on a cantilevered arm 8 in (205 mm) wide maximum, the clear space between the bottom of the arm and floor shall be 25 in (635 mm) minimum.

4.15.4.2 Floor Space. Forward approach units shall comply with 4.2. Units in alcoves shall comply with 4.2.4.4. See Fig. B4.15.2.1(b). Units not having the necessary knee and toe clearance or clear space under them shall comply with 4.2.4 and have a clear floor space that allows a person in a wheelchair to make a parallel approach to the unit.

4.16 Toilet, Bath, Dressing and Shower Rooms and Bathing Facilities

4.16.1 General. Accessible toilet rooms, bathrooms, bathing facilities, dressing rooms and shower rooms shall comply with 4.16.

4.16.2* Doors. All doors to accessible toilet rooms, bathrooms, bathing facilities, and shower rooms shall comply with 4.13. Doors shall not swing into the clear floor space required for any fixture unless the toilet or bathroom is for individual use only, or a clear floor space complying with 4.2.4.1 is provided beyond the arc of the door swing within the room.

4.16.3* Clear Floor Space. Accessible fixtures and operable parts shall comply with 4.17 through 4.22. An unobstructed turning space complying with 4.2.3 and 4.2.4.1 shall be provided within an accessible room. The clear floor spaces at fixtures and operable parts, the accessible route, and the turning space shall be permitted to overlap.

4.16.4 Operable Parts and Dispensers. Accessible operable parts, dispensers, receptacles, or other equipment shall comply with 4.25.

4.16.5* Medicine Cabinets. Accessible medicine cabinets shall be located with a usable shelf 44 in (1120 mm) maximum above the floor. The floor space shall comply with 4.2.4.

4.16.6* Mirrors. Mirrors, mounted above lavatories or sinks, shall have the bottom edge of the reflecting surface 38 in (965 mm) maximum above the floor. See Fig. B4.20.3.1. Full length mirrors used in conjunction with wheelchair accessible dressing rooms shall be 18 in (455 mm) wide minimum and shall be mounted with the bottom edge 18 in (455 mm) high maximum above the floor and the top edge 72 in (1830 mm) high minimum. Mirrors shall be located in a position affording a view to a person seated on a bench or a wheelchair, as well as to a person in a standing position.

4.17 Water Closets

4.17.1 General. Accessible water closets shall comply with 4.17. Water closets shall be mounted adjacent to a side wall or partition. The distance from the side wall or partition to the centerline of the water closet shall be 18 in (455 mm). Water closets in dwelling units shall comply with 4.33.3.2.

4.17.2* Clear Floor Space. Clear floor space for water closets not in stalls shall be 48 in (1220 mm) minimum in front of the water closet and 42 in (1065 mm) from the center line of the water closet on the side not adjacent to the wall. See Fig. B4.17.2.

4.17.3* Height. The top of water closet seats shall be 17 in to 19 in (430 mm to 485 mm) above the floor. Seats shall not be sprung to return to a lifted position. See Fig. B4.17.3.

4.17.4* Grab Bars. Grab bars for water closets shall comply with 4.24. Grab bars shall be provided on the rear wall and on the side wall closest to the water closet.

4.17.4.1 Side wall grab bar shall be 42 in (1065 mm) long minimum, located 12 in (305 mm) maximum from the rear wall and extending 54 in (1370 mm) minimum from the rear wall. See Fig. B4.17.3.

4.17.4.2 The rear wall grab bar shall be 24 in (610 mm) long minimum, centered on the water closet. Where space permits, the bar shall be 36 in (915 mm) long minimum, with the additional length provided on the transfer side of the water closet. See Fig. B4.17.4.

4.17.5* Flush Controls. Flush controls shall be hand operated or automatic and shall comply with 4.25.4. Hand operated controls for flushometers shall be mounted 44 in (1120 mm) maximum above the floor on the wide side of the toilet stall.

4.17.6 Dispensers. Toilet paper dispensers shall comply with 4.25.4 and shall be installed between 7 in and 9 in (180 mm and 230 mm) in front of the water closet. The outlet of the dispenser shall be located between 15 in and 48 in (380 mm and 1220 mm) above the floor. There shall be a clearance of 1 1/2 in (38 mm) minimum below and 12 in (305 mm) minimum above the grab bar. Dispensers shall not be of a type that control delivery, or that do not allow continuous paper flow.

4.18 Toilet Stalls

4.18.1 General. Accessible toilet stalls shall comply with 4.18.

4.18.2 Water Closets. Water closets in accessible toilet stalls shall comply with 4.17.

4.18.3* Wheelchair Accessible Stalls.

4.18.3.1 Wheelchair accessible stalls shall be 60 in (1525 mm) wide minimum and 56 in (1420 mm) deep minimum for wall hung water closets and 59 in (1500 mm) deep minimum for floor mounted water closets. See Fig. B4.18.3.1.

4.18.3.2 If the door swings into the stall, the required depth shall be increased by 36 in (915 mm) minimum. See Fig. B4.18.3.2.

4.18.3.3 Arrangements shown for stalls shall be permitted for left-hand or right-hand approach.

4.18.3.4 In wheelchair accessible stalls, the front partition and at least one side partition shall provide a toe clearance of 9 in (230 mm) minimum above the floor. Toe clearance is not required in stalls greater than 60 in (1525 mm) deep.

4.18.4* Ambulatory Accessible Stalls. Ambulatory accessible stalls shall be 36 in (915 mm) wide and 60 in (1525 mm) deep minimum. See Fig. B4.18.4.

4.18.5 Doors. Toilet stall doors shall comply with 4.13, except that if the approach is to the latch side of the stall door, the clearance between the door side of the stall and any obstruction shall be 42 in (1065 mm) minimum. The door shall be hinged 4 in (100 mm) maximum from the partition farthest from the water closet. A handle complying with 4.13.9

shall be placed on the inner side of the door near the pivot point or self-closing hinges shall be provided.

4.18.6 Grab Bars.

4.18.6.1 General. Grab bars shall comply with 4.24.

4.18.6.2 Wheelchair Accessible Stalls. A side-wall grab bar complying with 4.17.4.1, located on the wall closest to the water closet, and a rear-wall grab bar complying with 4.17.4.2 shall be provided. See Fig. B4.18.3.1.

4.18.6.3 Ambulatory Accessible Stalls. A side-wall grab bar complying with 4.17.4.1 shall be provided on both sides of the stall. See Fig. B4.18.4.

4.18.7* Coat Hooks and Shelves. Coat hooks provided within toilet stalls shall be 54 in (1370 mm) maximum above the floor. When provided, a fold down shelf shall be located between 40 in (1015 mm) minimum and 48 in (1220 mm) maximum above the floor.

4.19* Urinals

4.19.1 General. Accessible urinals shall comply with 4.19.

4.19.2 Height. Urinals shall be of the stall type or wall hung with the rim at 17 in (430 mm) maximum above the floor.

4.19.3 Clear Floor Space. Clear floor space 30 in by 48 in (760 mm by 1220 mm) minimum shall be provided in front of urinals to allow forward approach. This clear space shall comply with 4.2.4. Privacy shields shall not extend beyond the front edge of the urinal rim, unless they are 30 in (760 mm) apart minimum.

4.19.4 Flush Controls. Flush controls shall be hand operated or automatic. Hand operated flush controls, shall be mounted between 15 in (380 mm) minimum and 44 in (1120 mm) maximum above the floor and shall comply with 4.25.4.

4.20 Lavatories and Sinks

4.20.1 General. Accessible lavatory fixtures, sinks, vanities, and built-in lavatories shall comply with 4.20.

4.20.2 Height

4.20.2.1* Lavatories. Lavatories shall be mounted with the rim 34 in (865 mm) maximum above the floor and with a clearance of 29 in (735 mm) minimum from the floor to the bottom of the front edge

of the apron.

4.20.2.2 Sinks. Sinks shall be mounted with the counter or rim 34 in (865 mm) maximum above the floor. Sinks shall be 6 1/2 in (165 mm) deep maximum. Sinks in kitchens of accessible dwelling units shall comply with 4.33.4.5.

4.20.3 Clearances.

4.20.3.1 Knee and Toe Clearances. Fixtures shall extend 17 in (430 mm) minimum from the wall. Clear knee space shall be provided in accordance with 4.2.4.3 Clearance between the bottom of the front edge of the apron and the floor shall be 29 in (735 mm) minimum. The clear knee space shall be 8 in (205 mm) in depth minimum at 27 in (685 mm) minimum above the floor or ground and 11 in (280 mm) in depth minimum at 9 in (230 mm) minimum above the floor or ground. Clear toe space shall be provided in accordance with 4.2.4.3. The dip of the overflow shall be ignored when checking the clearances. See Fig. B4.20.3.1.

4.20.3.2 Clear Floor Space. Clear floor space shall comply with 4.2.4. Clear floor space, 30 in by 48 in (760 mm by 1220 mm) minimum, shall be provided in front of a lavatory or sink to allow a forward approach and shall extend 19 in (485 mm) maximum under the lavatory or sink. See Fig. B4.20.3.2.

4.20.4* Exposed Pipes and Surfaces. Water supply and drain pipes under lavatories or sinks shall be insulated or otherwise configured to protect against contact. See Fig. B4.20.3.1. There shall be no sharp or abrasive surfaces under lavatories and sinks.

4.20.5* Faucets. Faucets shall comply with 4.25.4. Self-closing faucets, when used, shall remain open for 10 seconds minimum.

4.21 Bathtubs

4.21.1 General. Accessible bathtubs shall comply with 4.21. Bathtubs in dwelling units shall comply with 4.33.3.4.

4.21.2 Floor Space. Clear floor space in front of bathtubs shall be 30 in by 60 in (760 mm by 1525 mm) minimum for a parallel approach and 48 in by 60 in (1220 mm by 1525 mm) minimum for a forward approach to a tub without a seat at the head of the tub. When a seat is provided at the head of the tub, the clear space shall be 30 in by 93 in (760 mm by 2360 mm) minimum. Lavatories complying with 4.20.2.1 shall be permitted at the foot end of

the clear space. See Fig. B4.21.2.

4.21.3* Seat. A removable in-tub seat or a permanent seat at the head end of the tub shall be provided. See Fig. B4.21.2 and B4.21.4. Permanent seats located at the head of the tub shall be 15 in (380 mm) wide minimum. Seats shall be built-in or mounted securely and shall not slip during use. The structural strength of seats and their attachments shall comply with 4.24.3.

4.21.4 Grab Bars. Grab bars shall comply with 4.24 and unless otherwise required shall be 33–36 in (840–915 mm) above the floor.

4.21.4.1 For bathtubs with permanent seats, a grab bar 48 in (1220 mm) long minimum shall be installed on the back wall 15 in (380 mm) maximum from the head end wall and 12 in (305 mm) maximum from the foot end wall.

4.21.4.2 For bathtubs without permanent seats, a grab bar 24 in (610 mm) long minimum shall be installed on the back wall 24 in (610 mm) maximum from the head end wall and 12 in (305 mm) maximum from the foot end wall. A grab bar 12 in (305 mm) long minimum shall be installed on the head end wall at the front edge of the tub.

4.21.4.3 For bathtubs with or without permanent seats, a grab bar 24 in (610 mm) long minimum shall be installed on the foot end wall at the front edge of the tub. On the back wall a bar of the same length as the higher bar shall be provided 9 in (230 mm) above the rim of the tub. See Fig. B4.21.4.

4.21.5 Controls. Faucets and other controls shall comply with 4.25.4. Controls shall be located between the rim of the tub and the grab bar at the foot of the tub. See Fig. B4.21.4.

4.21.6 Shower Unit. A shower spray unit shall be provided with a hose, 60 in (1525 mm) long minimum, that can be used as a fixed shower head or as a hand-held shower. If an adjustable-height shower head mounted on a vertical bar is used, the bar shall be installed so as not to obstruct the use of grab bars.

4.21.7 Bathtub Enclosures. Enclosures for bathtubs shall not obstruct controls or transfer from wheelchairs onto bathtub seats or into tubs. Enclosures shall not have tracks mounted on the bathtub rim.

4.21.8 Rim Height. Bathtub rims shall be 17 in to 19 in (430 mm to 480 mm) measured from floor to top of rim.

4.22 Shower Stalls

4.22.1* General. Accessible shower stalls shall comply with 4.22.

4.22.2 Size and Clearances.

4.22.2.1* Transfer-Type Showers. Transfer-type shower stalls shall be 36 in by 36 in (915 mm by 915 mm) inside finished dimension with clear floor space of 36 in (915 mm) wide minimum by 48 in (1220 mm) long minimum measured from the control wall. See Fig. B4.22.2.1.

4.22.2.2* Roll-in Type Showers. Roll-in type shower stalls shall be 30 in by 60 in (760 mm by 1525 mm) inside finished dimension minimum with clear floor space of 36 in wide by 60 in long (915 mm by 1525 mm) minimum. Lavatories complying with 4.20.2.1 shall be permitted at either end of the clear space. See Fig. B4.22.2.2.

4.22.3* Seat. A folding or non-folding seat shall be provided in transfer-type shower stalls and shall be L-shaped. See Fig. B4.22.3. The seat shall be mounted 17 in to 19 in (430 mm to 485 mm) above the bathroom floor and shall extend the full depth of the stall. The rear edge of the seat shall be 2 1/2 in (64 mm) maximum and the front edge 15 in to 16 in (380 mm to 405 mm) from the seat wall. The "L" portion of the seat shall be 1 1/2 in (38 mm) maximum from the back wall and be 14 in to 15 in (355 mm to 380 mm) from the back wall to the inner edge of the seat. The front edge of the "L" shall be 22 in to 23 in (560 mm to 585 mm) from the seat wall. The seat shall be on the wall opposite the controls. The structural strength of seats and their attachments shall comply with 4.24.3.

4.22.4 Grab Bars. Grab bars shall comply with 4.24.

4.22.4.1 Transfer Type Showers. Grab bar shall be extended across the control wall and back wall to a point 18 in (455 mm) from the control wall. See Fig. B4.22.4(a).

4.22.4.2 Roll-in Type Showers. Grab bars shall be provided on the three walls of the shower. See Fig. B4.22.4(b).

4.22.5 Controls. Faucets and other controls shall comply with 4.25.4. Controls in roll-in showers shall be located on the back wall 38 in to 48 in (965 mm to 1220 mm) above the shower floor. See Fig. B4.22.4(b). In transfer-type shower stalls, all controls, faucets, and the shower unit shall be mounted on the side wall opposite the seat 38 in to 48 in (965 mm to 1220 mm) above the shower floor. See

Fig.4.22.4(a).

4.22.6* Shower Unit. A shower spray unit shall be provided with a hose 60 in (1525 mm) long minimum that can be used as a fixed shower head or as a hand-held shower. In transfer type showers, the controls and shower unit shall be located on the control wall within 15 in (380 mm), left or right, of the centerline of the seat. In roll-in type showers, shower spray units mounted on the back wall shall be mounted 27 in (685 mm) maximum from the side wall. If an adjustable-height shower head mounted on a vertical bar is used, the bar shall be installed so as not to obstruct the use of grab bars.

4.22.7 Thresholds. Thresholds in shower stalls shall be 1/2 in (13 mm) high maximum in accordance with 4.5.

4.22.8 Shower Enclosures. Enclosures for shower stalls shall not obstruct controls or obstruct transfer from wheelchairs onto shower seats.

4.23 Storage

4.23.1 General. Accessible storage facilities including cabinets, shelves, closets, lockers and drawers shall comply with 4.23.

4.23.2 Clear Floor Space. A clear floor space complying with 4.2.4 that allows either a forward or parallel approach by a person using a wheelchair shall be provided at accessible storage facilities.

4.23.3 Height. Accessible storage spaces shall be within at least one of the reach ranges specified in 4.2.5 and 4.2.6. Clothes rods shall be 54 in (1370 mm) maximum above the floor. See Fig. B4.23.

4.23.4* Hardware. Hardware for accessible storage facilities shall comply with 4.25.4.

4.24 Grab Bars, and Tub and Shower Seats

4.24.1* General. Grab bars and tub and shower seats in accessible toilet or bathing facilities shall comply with 4.24.

4.24.2 Grab Bars.

4.24.2.1 Size and Spacing of Grab Bars. The diameter or width of the gripping surfaces of a grab bar shall be 1 1/4 in to 1 1/2 in (32 mm to 38 mm), or the shape shall provide an equivalent gripping surface. If grab bars are mounted adjacent to a wall, the space between the wall and the grab bar shall be 1 1/2 in (38 mm). See Fig. B4.24.2.1.

4.24.2.2 Position of Grab Bars. Grab bars shall be mounted in a horizontal position, 33 in to 36 in

(840 mm to 915 mm) above the floor, except where a supplemental grab bar is installed in relation to a fixture rim or surface.

4.24.2.3 Surface Hazards. Grab bars and any wall or other surfaces adjacent to grab bars shall be free of sharp or abrasive elements. Edges shall have a radius of 1/8 in (3 mm) minimum.

4.24.2.4 Fittings. Grab bars shall not rotate within their fittings.

4.24.2.5* Method of Mounting. Grab bars shall be mounted in any manner that provides a gripping surface at the locations specified in this standard and that does not obstruct the required clear floor space.

4.24.3 Structural Strength. Allowable stresses in bending, shear and tension shall not be exceeded for materials used when a vertical or horizontal force of 250 lb (1112 N) is applied at any point on the grab bar, seat, fastener mounting device or supporting structure.

4.25 Operable Parts of Equipment and Appliances

4.25.1* General. Operable parts of equipment and appliances in accessible spaces, along accessible routes, or as part of accessible elements shall comply with 4.25.

4.25.2 Clear Floor Space. Clear floor space complying with 4.2.4 that allows a forward or a parallel approach by a person using a wheelchair shall be provided at operable parts of equipment and appliances.

4.25.3* Height. Operable parts of equipment and appliances shall be placed within one or more of the reach ranges specified in 4.2.5 and 4.2.6.

Exception: Electrical and communications-system receptacles on walls shall be mounted 15 in (380 mm) minimum above the floor unless the use of special equipment requires location at a different position.

4.25.4 Operation. Operable parts of equipment and appliances shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate operable parts shall be 5 lb (22.2 N) maximum.

4.26 Alarms

4.26.1* General. Accessible emergency warning systems shall include both audible alarm signals

complying with 4.26.2 and visible signaling appliances complying with 4.26.3.

4.26.2* Audible Alarm Signals. Audible emergency alarms shall produce a sound that exceeds the prevailing equivalent sound level in the room or space by 15 decibels minimum, or exceeds any maximum sound level with a duration of 30 seconds minimum by 5 decibels minimum, whichever is louder. Sound levels for alarm signals shall be 120 decibels maximum.

4.26.3* Visible Signaling Appliances. Visible signaling appliances shall have the following photometric and location features.

4.26.3.1 General Features

4.26.3.1.1 Lamp shall be xenon strobe type producing a clear or nominal white light.

4.26.3.1.2 Flash rate shall be 0.33 Hz minimum and 3 Hz maximum.

4.26.3.1.3 Wall mounted visible signaling appliances shall be 80 in (2030 mm) minimum and 96 in (2440 mm) maximum above the floor.

Exception: Portable visible signaling appliances which incorporate smoke detectors shall be wall mounted 4 in (100 mm) minimum and 12 in (305 mm) maximum from the ceiling.

4.26.3.2 Awake Mode

4.26.3.2.1 For rooms and similar spaces that are not intended for sleeping, visible signaling appliances shall be located in accordance with Table 4.26.3.2.1. The separation between adjacent appliances shall not exceed 100 ft (30 m). The minimum square room size contained in Table 4.26.3.2.1 that entirely encompasses the area of the room, or subdivision of the room into multiple square areas, shall be used to determine the required number and intensity of appliances in accordance with Table 4.26.3.2.1.

4.26.3.2.2 For corridors 20 ft (6 m) wide maximum, visible signaling appliances shall be located in accordance with Table 4.26.3.2.2. In these corridors, visible signaling appliances shall be located 15 ft (5 m) maximum from the end of the corridor, with a separation of 100 ft (30 m) maximum between appliances. For corridors more than 20 ft (6 m) wide, visible signaling appliances shall be located in accordance with Table 4.26.3.2.1.

4.26.3.2.3 The light output for visible signaling appliances shall conform to Table 4.26.3.2.1 or 4.26.3.2.2, depending on room size or corridor

length. For corridors, visible signaling appliances shall be rated 15 candela (cd) minimum.

4.26.3.2.4 The signal shall be visible, directly or by reflection, from any point in the room or space.

4.26.3.3 Asleep Mode

4.26.3.3.1 In rooms intended for sleeping where visible signal appliances are provided, they shall be actuated by the building alarm system and by the room smoke detector. The visible signaling appliance shall provide a light output of 110 candela minimum.

4.26.3.3.2 Where used in a single station portable or hardwired system, the alarm shall be a combination single station smoke detector and visible signaling appliance. The visible signaling appliance shall provide a light output of 177 candela minimum. The visible signaling appliance shall be powered by the building electrical system or by a standard 110-120 volt receptacle that is not subject to loss of power by a wall switch.

4.26.3.3.3 All portable alarm appliances shall have an individual printed instruction card, either available with the alarm appliance or posted on the room door of each sleeping room or space where the portable alarm plug receptacles are located.

4.27* Detectable Warnings - Standardization

Where required, detectable warnings shall be standard within a building, facility, site or complex of buildings.

4.28 Signage

4.28.1* General. Accessible signage shall comply with 4.28.2, 4.28.3, and 4.28.5. Tactile signage shall comply with 4.28.2, 4.28.5, 4.28.6 and 4.28.7.

4.28.2* Character Proportion. Letters and numbers on signs shall have a width-to-height ratio between 3:5 and 1:1 and a stroke-width-to-height ratio between 1:5 and 1:10, utilizing an upper-case "X" for measurement.

4.28.3* Character Height. Letter and number heights for signs of various sizes shall conform to Table 4.28.3.

Exception: Character heights shall be 5/8 in (16 mm) high minimum for building directories.

4.28.4* Pictograms. Where pictograms are required, they shall have a 6 in (150 mm) minimum size measured at the border. Where text descriptors for pictograms are required, they shall comply

Table 4.26.3.2.1 – Room spacing allocation

Maximum room size ft	One light cd	Two lights opposite walls cd	One light per wall cd
20 x 20	15	—	—
30 x 30	30	15	—
40 x 40	60	30	15
50 x 50	95	60	30
60 x 60	135	95	30
70 x 70	185	110	60
80 x 80	—	140	60
90 x 90	—	180	95
100 x 100	—	—	95
110 x 110	—	—	135
120 x 120	—	—	160
130 x 130	—	—	185

Note: The values in column two for "One light" are based on locating the visible signaling appliance at the half-way distance of the longest wall. In square rooms, the "Maximum room size" shall be determined by: (a) The distance from the appliance to the farthest opposite wall; or (b) Twice the distance from the appliance to the farthest adjacent wall, whichever is greater.

Table 4.26.3.2.2 – Corridor spacing allocation

Corridor length (20 ft Maximum Width) ft	Minimum number of 15 cd visible appliances required
≤30	1
>30 – 130	2
>130 – 230	3
>230 – 330	4
>330 – 430	5
>430 – 530	6

with the tactile character provisions of 4.28.6 and 4.28.7.

4.28.5* Finish and Contrast. The characters, symbols and background of signs shall be eggshell, matte, or other non-glare finish. Characters and symbols shall contrast with their background, with either light characters on a dark background or dark characters on a light background.

4.28.6* Tactile Characters or Symbols. Raised characters, symbols and Braille shall comply with 4.28.6.1 and 4.28.6.2.

4.28.6.1 Raised Characters and Symbols. Characters and symbols on tactile signs shall be raised 1/32 in (0.8 mm) minimum. Raised characters and symbols shall be in uppercase characters. Raised characters and symbols shall be 5/8 in (16 mm) high minimum, and 2 in (51 mm) maximum. Raised characters and symbols shall be accompanied by Braille in accordance with 4.28.6.2.

4.28.6.2 Braille. Braille shall be separated 1/2 in (13 mm) minimum from the corresponding raised characters or symbols. Braille provided in accordance with 4.10.1.12 shall be placed 3/16 in (5 mm) minimum below the corresponding raised characters or symbols. Braille shall be Grade II and shall conform to Specification #800, National Library Service, Library of Congress.

4.28.7* Location of Tactile Signage. Tactile signage shall be located alongside the door on the latch side and shall be mounted at 60 in (1525 mm) above the adjacent finished floor to the centerline of the sign. In locations having double doors, tactile signs shall be mounted to the right of the right hand door. Where there is no wall space on the latch side of the door, including double leaf doors, signs shall be placed on the nearest adjacent wall.

4.28.8* Symbols of Accessibility.

4.28.8.1 International Symbol of Accessibility. Where the international symbol of accessibility is required, it shall be proportioned and displayed as shown in Fig. 4.28.8.1.

4.28.8.2 International Symbol of Telecommunication Devices for the Deaf (TDD). Where telecommunication devices for the deaf are required, they shall be identified by the international telecommunications device for the deaf symbol and proportioned as shown in Fig. 4.28.8.2.

4.28.8.3 Assistive Listening Systems. Where permanently installed assistive listening systems are required, they shall be identified by the international symbol of access for hearing loss proportioned and displayed as shown in Fig. 4.28.8.3.

4.28.8.4 Volume Controlled Telephones. Where telephones are required to have volume controls, they shall be identified by a sign containing a depiction of a telephone handset with radiating sound waves, such as is shown in Fig. 4.28.8.4.

4.29 Telephones

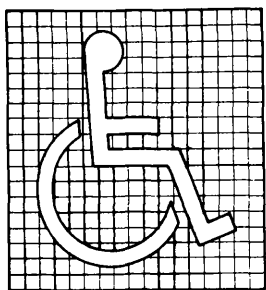
4.29.1 General. Accessible public telephones and related equipment shall comply with 4.29.

4.29.2 Clear Floor Space or Ground Space. Clear floor or ground space shall be provided at each accessible public telephone in accordance with 4.29.2.1 or 4.29.2.2. The required clear space shall comply with 4.2.4 and shall not be restricted by bases, enclosures, and fixed seats.

4.29.2.1 Parallel Approach. Where a parallel approach by a person in a wheelchair is provided, the clear floor space or ground space shall be 30 in deep by 48 in wide (760 mm by 1220 mm) mini-

Table 4.28.3 – Letter and number heights

Height above floor/ground	Minimum character height
More than 80 in (2030 mm)	3 in (75 mm)
More than 60 in (1525 mm) but not more than 80 in (2030 mm)	2 in (51 mm)
More than 48 in (1220 mm) but not more than 60 in (1525 mm)	1 in (25 mm)



(a) Proportions



(b) display conditions

Fig. 4.28.8.1
International Symbol of Accessibility

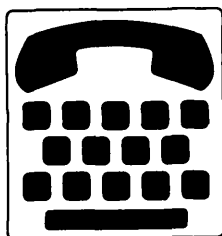


Fig. 4.28.8.2
International TDD Symbol



Fig. 4.28.8.3
International Symbol of
Access for Hearing Loss



Fig. 4.28.8.4
Volume Controlled Telephone

mum. The distance from the edge of the telephone enclosure to the face of the telephone unit shall be 10 in (255 mm) maximum. See Fig. B4.29.2.1.

4.29.2.2 Forward Approach. Where a forward approach by a person in a wheelchair is provided, the clear floor space or ground space shall be 48 in (1220 mm) deep minimum. Where the distance from the edge of the telephone enclosure to the face of the telephone unit is 24 in (610 mm) maximum, the clear space shall be 30 in (760 mm) wide minimum. Where the distance from the edge of the telephone enclosure to the face of the telephone unit is 24 in (610 mm) minimum, the clear space shall be 36 in (915 mm) wide minimum. The distance from the front edge of a counter within the enclosure to the face of the telephone unit shall be 20 in (510 mm) maximum. See Fig. B4.29.2.2.

4.29.3* Mounting Height. The highest operable parts that are essential to the use of the telephone shall be located within the reach ranges specified in 4.2.5 or 4.2.6.

4.29.4 Protruding Objects. Telephones, enclosures, and related equipment shall comply with 4.4.

4.29.5 Hearing-aid Compatible and Volume Controlled Telephones. Telephones shall be hearing-aid compatible. Volume control shall be capable of increasing the volume within the range of 12 db minimum and 18 db maximum above the nonamplified mode, except that the 18 db maximum shall not apply where an automatic reset is provided.

4.29.6 Controls. Accessible telephones shall have push button controls where service for such equipment is available.

4.29.7 Telephone Directories. Telephone directories, if provided, shall be located in accordance with 4.2.

4.29.8 Cord Length. Accessible telephones shall be equipped with a handset cord length of 29 in (735 mm) minimum.

4.29.9 Telecommunications Device for the Deaf (TDD)

4.29.9.1 Where used with a pay telephone, telecommunications devices for the deaf shall be permanently affixed within, or adjacent to, the telephone enclosure. If an acoustic coupler is used, the telephone cord shall be sufficiently long to

allow connection of the TDD and the telephone receiver.

4.29.9.2 Where pay telephones designed to accommodate a portable TDD are provided, they shall be equipped with a shelf and an electrical outlet within or adjacent to the telephone enclosure. The telephone handset shall be capable of being placed flush on the surface of the shelf. The shelf shall be capable of accommodating a TDD and shall have a 6 in (150 mm) high minimum vertical clearance above the area where the TDD is to be located.

4.30* Automatic Teller Machines

4.30.1 Mounting. Accessible automatic teller machines shall be mounted so that all features requiring user activation comply with 4.2.5 or 4.2.6. Clear floor space shall comply with 4.2.4. Input into machines shall be made possible by tactile markings, and private audible output shall be made available so that the machine can be used entirely without vision.

4.30.2 Display Screen. Where print appears on the display screen, the automatic teller machine video display screen shall use sans serif print that is a minimum of 18 point size, and shall contrast with the background by a minimum of 70 percent. Where the automatic teller machine is designed to be used by pedestrians, the video display screen shall be placed so that the lower edge shall be at a height of 38 in (965 mm) maximum off the ground or be adjustable.

4.31 Seating, Tables, Work Surfaces, and Service Counters

4.31.1 General. Accessible fixed or built-in seating, benches, tables, service counters or work surfaces shall comply with 4.16.6 and 4.31.

4.31.2.1 Seating. Accessible seating spaces provided at tables, service counters, or work surfaces for people in wheelchairs shall have a clear floor space complying with 4.2.4. Such clear floor space shall overlap knee space by not more than 19 in (485 mm). See Fig. B4.31.2.

4.31.2.2 Benches. Accessible benches shall be 20 in to 24 in (510 mm to 610 mm) wide by 42 in to 48 in (1065 mm to 1220 mm) long fixed to a wall along the longer dimension. The bench shall be mounted 17 in to 19 in (430 mm to 480 mm) above the floor. Clear floor space shall be provided in accordance with 4.2.4. The structural strength of the

benches shall conform to 4.24. Where installed in wet locations the surface of the bench shall be slip resistant and water shall not accumulate upon the surface.

4.31.3 Knee Clearances. Accessible seating for people in wheelchairs at tables, service counters, and work surfaces shall have knee spaces 27 in (685 mm) high minimum, 30 in (760 mm) wide minimum, and 19 in (485 mm) deep minimum. See Fig. B4.31.2.

4.31.4* Height of Work Surfaces and Service Counters. The tops of accessible portions of tables, service counters, tray slides and work surfaces shall be from 28 in to 34 in (710 mm to 865 mm) from the floor or ground.

4.31.5 Checkout Counters. Checkout counter surfaces shall be 38 in (965 mm) maximum above the finished floor. The top of the counter edge protection shall be 40 in (1015 mm) maximum above the finished floor.

4.32 Auditorium and Assembly Areas

4.32.1 General. Accessible viewing positions in auditorium and assembly areas with fixed seating shall comply with 4.32.

4.32.2* Size of Wheelchair Locations.

4.32.2.1 Wheelchair locations with forward or rear access shall provide clear ground or floor spaces of 33 in (840 mm) wide by 48 in (1220 mm) deep minimum. See Fig. B4.32.2(a).

4.32.2.2 Wheelchair locations with side access shall provide minimum clear ground or floor spaces of 33 in (840 mm) wide and 60 in (1525 mm) deep. See Fig. B4.32.2(b).

4.32.3* Placement of Wheelchair Locations.

4.32.3.1 At least one wheelchair location shall accommodate two wheelchairs minimum.

4.32.3.2 Wheelchair locations shall be adjacent to an aisle. They shall also be adjacent to a fixed or removable seat located such that each wheelchair location has, immediately to one side, a fixed or removable seat.

4.32.3.3 Wheelchair locations shall provide lines of sight comparable to those of all viewing areas.

4.32.4 Aisles. Ramps serving as aisles adjacent to seating areas shall be permitted to have a running slope not steeper than 1:8 where such slope is required to maintain adequate sightlines. Such

ramped aisles shall be permitted as an accessible route to seating areas, to performing areas adjacent to seating, and as means of egress from such areas.

4.32.5 Surfaces. Ground or floor surfaces at wheelchair locations shall have a slope not steeper than 1:48 and shall comply with 4.5.

4.32.6* Placement of Listening Systems. Individual fixed seats, served by a listening system, shall be located within a 50 ft (15 m) distance of the stage or playing area and shall have complete view of the stage or playing area. In a motion picture theater, individual fixed seats, served by a listening system, shall be located any place within the auditorium that has a complete view of the screen.

4.32.7 Types of Listening Systems. Induction loops, infrared systems, FM and AM radio frequency systems, hard-wired earphones, and other equivalent devices shall be permitted as acceptable listening systems.

4.33 Dwelling Units

4.33.1* General. Accessible dwelling units shall comply with 4.33.

4.33.2* Adaptability. Both adaptable dwelling units and units in which fixtures are permanently installed within the heights specified in 4.33.3 and 4.33.4 shall be considered accessible dwelling units.

4.33.3* Bathrooms. Accessible bathrooms shall comply with 4.33.3.

4.33.3.1 Doors. Doors shall not swing into the clear floor space required for any fixture unless the toilet or bathroom is for individual use only, or a clear floor space complying with 4.2.4.1 is provided beyond the arc of the door swing within the room.

4.33.3.2 Water Closets

4.33.3.2.1 Water closets shall be located in the corner of the adaptable bathroom. See Fig. B4.33.3.2. A 48 in (1220 mm) minimum clear space shall be provided in front of the bowl and from the side wall. The distance from the centerline of water closet to accessible lavatory shall be 18 in (455 mm) minimum and from the centerline of the water closet to the wall shall be 18 in (455 mm). The clear space shall be permitted at either side of

the water closet.

4.33.3.2.2 Water closet height shall be from 15 in (380 mm) minimum to 19 in (485 mm) maximum, measured from the floor to the top of the toilet seat.

4.33.3.2.3 Grab bars complying with 4.24 shall be installed, or structural reinforcement or other provisions shall be made that will allow installation of grab bars meeting these requirements.

4.33.3.2.4 The toilet paper dispenser shall comply with 4.16.4.

4.33.3.3 Lavatory, Mirrors, and Medicine Cabinets

4.33.3.3.1 The lavatory shall comply with 4.20.

4.33.3.3.2 Medicine cabinets provided under the lavatory shall provide, or shall be removable to provide, the clearances specified in 4.20.2.

4.33.3.3.3 Medicine cabinets provided above the lavatory shall comply with 4.16.5.

4.33.3.3.4 Mirrors shall comply with 4.16.6.

4.33.3.4 Bathtubs. Where a bathtub is provided, it shall have the following features:

4.33.3.4.1 Clear floor space at bathtubs shall comply with 4.21.2.

4.33.3.4.2 A removable in-tub seat or permanent seat at the head end of the tub shall be provided in compliance with 4.21.3. The structural strength of seats and their attachments shall comply with 4.24.3. In-tub seats shall be capable of being mounted securely and shall not slip during use.

4.33.3.4.3 Grab bars shall be installed in compliance with 4.21.4, or structural reinforcement shall be made that will allow installation of grab bars meeting these requirements.

4.33.3.4.4 Faucets and other controls shall comply with 4.21.5.

4.33.3.4.5 A shower spray unit shall be provided in compliance with 4.21.6.

4.33.3.5 Showers. Where a shower is provided, it shall comply with 4.22.

Exception 1. In lieu of providing a seat, the wall opposite the controls in a shower stall shall be structurally reinforced the full depth of the stall at a height from 16 in to 20 in (405 mm to 510 mm) measured from the bathroom floor, to allow for the installation of a shower seat.

Exception 2. Structural reinforcement shall be permitted that will allow installation of grab bars complying with 4.22.4.

4.33.3.6 Clear Floor Space. Clear floor space at fixtures shall be permitted to overlap.

4.33.4 Kitchens. Accessible kitchens and their components shall comply with the requirements of 4.33.4.

4.33.4.1 Clearance. Where counters provide the knee clearances specified in 4.20.3, clearances between those counters and all opposing base cabinets, countertops, appliances, or walls in kitchens shall be 40 in (1015 mm) minimum, except in U-shaped kitchens, where such clearances shall be 60 in (1525 mm) minimum.

4.33.4.2 Clear Floor Space. A clear floor space 30 in by 48 in (760 mm by 1220 mm) minimum complying with 4.2.4 that allows either a forward or a parallel approach by a person in a wheelchair shall be provided at all appliances in the kitchen, including the range or cooktop, oven, refrigerator/freezer, dishwasher, and trash compactor. Laundry equipment located in the kitchen shall comply with 4.33.5.

4.33.4.3 Operable Parts. All operable parts in kitchens shall comply with 4.25.

4.33.4.4 Work Surfaces. At least one 30 in (760 mm) wide minimum section of counter shall provide a work surface that complies with the following requirements. See Fig. B4.33.4.4.

4.33.4.4.1 The counter shall be adjustable or replaceable as a unit at variable heights between 28 in and 36 in (710 mm and 915 mm), measured from the floor to the top of the counter surface, or shall be mounted at a fixed height of 34 in (865 mm), measured from the floor to the top of the counter surface.

4.33.4.4.2 Base cabinets, if provided, shall be removable under the full 30 in (760 mm) minimum frontage of the counter. The finished floor shall extend under the counter to the wall.

4.33.4.4.3 Counter thickness and supporting structure shall extend 2 in (51 mm) maximum over the required clear area.

4.33.4.4.4 A clear floor space of 30 in by 48 in (760 mm by 1220 mm) minimum shall allow a forward approach to the counter. The clear floor space shall be permitted to extend 19 in (485 mm) maximum underneath the counter. The knee space

shall have a clear width of 30 in (760 mm) minimum.

4.33.4.4.5 There shall be no sharp or abrasive surfaces under such counters.

4.33.4.5* Sink. The sink and surrounding counter shall comply with the following requirements. See Fig. B4.33.4.5.

4.33.4.5.1 The sink and surrounding counter shall be adjustable or replaceable as a unit at variable heights between 28 in and 36 in (710 mm and 915 mm), measured from the finished floor to the top of the counter surface or sink rim, or shall be mounted at a fixed height of 34 in (865 mm), measured from the finished floor to the top of the counter surface or sink rim.

4.33.4.5.2 Where sinks are installed to be adjustable in height, rough-in plumbing shall be located to accept connections of supply and drain pipes for sinks mounted at the height of 28 in (710 mm).

4.33.4.5.3 The depth of a sink bowl shall be 6 1/2 in (165 mm) maximum. Only one bowl of double-bowl or triple-bowl sinks needs to meet this requirement.

4.33.4.5.4 Faucets shall comply with 4.25.4.

4.33.4.5.5 Base cabinets, if provided, shall be removable under the full 30 in (760 mm) minimum frontage of the sink and surrounding counter. The finished flooring shall extend under the counter to the wall.

4.33.4.5.6 Counter thickness and supporting structure shall extend 2 in (51 mm) maximum over the required clear space.

4.33.4.5.7 A clear floor space of 30 in by 48 in (760 mm by 1220 mm) minimum shall allow forward approach to the sink. The clear floor space shall be permitted to extend 19 in (485 mm) maximum underneath the sink. The knee space shall have a clear width of 30 in (760 mm) minimum.

4.33.4.5.8 Water supply pipes and drain pipes under sinks shall be protected in accordance with 4.20.4

4.33.4.6* Ranges and Cooktops. Ranges and cooktops shall comply with 4.33.4.2 and 4.33.4.3. If ovens or cooktops have knee spaces underneath, they shall be insulated or otherwise protected on the exposed contact surfaces for protection against burns, abrasions, or electrical shock. The

clear floor space shall be permitted to overlap the knee space, if provided, by 19 in (485 mm) maximum. The location of controls for ranges and cooktops shall not require reaching across burners.

4.33.4.7* Ovens. Ovens shall comply with 4.33.4.2 and 4.33.4.3. Ovens shall be of the self-cleaning type or be located adjacent to an adjustable height counter with a 30 in (760 mm) wide minimum knee space below. See Fig. B4.33.4.7. For side-opening ovens, the door latch side shall be next to the open counter space, and there shall be a pull-out shelf under the oven extending the full width of the oven and pulling out 10 in (255 mm) minimum when fully extended. Ovens shall have controls on front panels. Controls shall be permitted to be located on either side of the door.

4.33.4.8* Refrigerator/Freezers. Refrigerators and freezers shall comply with 4.33.4.2 and 4.33.4.3. Side-by-side combination freezer and refrigerator appliances shall have at least 50 percent of the freezer space and at least 50 percent of the refrigerator space located 54 in (1370 mm) maximum above the floor. Other combination refrigerators and freezers shall have at least 50 percent of the freezer space and 100 percent of the refrigerator space and controls 54 in (1370 mm) maximum above the floor. Freezers with less than 100 percent of the storage volume within the limits specified in 4.2.5 or 4.2.6 shall be the self-defrosting type.

4.33.4.9 Dishwashers. Dishwashers shall comply with 4.33.4.2 and 4.33.4.3. Dishwashers shall have all rack space accessible from the front of the machine for loading and unloading dishes.

4.33.4.10* Kitchen Storage.

4.33.4.10.1 Cabinets, drawers, and shelf storage areas shall comply with 4.23.

4.33.4.10.2 At least one shelf of all cabinets and storage shelves mounted above work counters shall be 48 in (1220 mm) maximum above the floor. See Fig. B4.33.4.4.

4.33.4.10.3 Door pulls or handles for wall cabinets shall be mounted as close to the bottom of cabinet doors as possible. Door pulls or handles for base cabinets shall be mounted as close to the top of cabinet doors as possible.

4.33.5 Laundry Facilities. If laundry equipment is provided within individual accessible dwelling units, or if separate laundry facilities serve one or more accessible dwelling units, they shall meet the

requirements of 4.33.5.1 and 4.33.5.2.

4.33.5.1 Washing Machines and Clothes Dryers. Accessible washing machines and clothes dryers in common-use laundry rooms shall be front loading and shall comply with 4.2.4.

4.33.5.2 Operable Parts. Laundry equipment shall comply with 4.25.

Appendix A (informative)

Additional Information

This Appendix contains additional information that is intended to help the user understand the minimum requirements of the standard or to design or regulate the construction of buildings or facilities for greater accessibility and usability. The subsection numbers correspond to the sections or subsections of the standard to which the material relates and are, therefore, not consecutive (for example, A4.2.1 contains additional information relevant to 4.2.1). Sections in the standard for which additional material appears in this Appendix have been indicated by an asterisk. All figures referenced in this appendix are contained in Appendix B and are designated Fig. BAxxx.

A1.1 Purpose. Independence for persons with physical disabilities is a primary goal of this standard. For a person with a physical disability to achieve independence, it is essential that buildings and facilities be viewed in the design process from that person's perspective based on a specific disability or disabilities.

A2.3 Historic Buildings and Facilities^{1) 2) 3)}

Accessibility in historic buildings and facilities, that are required to be made accessible and usable by persons with disabilities, should be accomplished in a manner that maintains the significant historic fabric and historic aspects of such buildings and facilities.

If the historic fabric or historic aspects are threatened or destroyed by strict compliance with the provisions of this standard, reasonably equivalent access and use may be accomplished by using the concepts in A2.3. Reasonably equivalent access and use means that the entry to, and use of, a building or facility by persons with disabilities is achieved with standards or measurements which are individually tailored to the historic building or facility.

Should the above still be deemed to destroy the historic fabric or historic aspect, additional consideration may be given to the following:

1. Deviations should be on an item-by-item or case-by-case basis.

2. Interpretive exhibits and/or equal services of significant historic aspects which do not comply with this standard are provided for the public in a location fully accessible to and usable by persons with disabilities, including people with hearing and sight impairment.

3. Services are provided in an accessible location equal to those provided in the locations which do not comply with this standard.

4. The owner/designer has provided written documentation stating the reasons for the consequent exemption. Such statement should include the opinions and/or comments of a representative local group of persons with disabilities and be submitted to the administrative authority for approval.

If compliance with 4.8 cannot be achieved, a ramp meeting the criteria in Table A2.3(a) may be used as part of an accessible route at an entrance. In the absence of an entrance used by the public complying with 4.14, then access at any entrance not used by the public but open (unlocked) with directional signs at the principal entrance may be used. Nominal minimum door leaf widths are shown in Table A2.3(b).

A3.4 Definitions

automatic door: The switch that begins the cycle for an automatic door is a photo electric device, floor mat, sensing device, or manual switch mount-

¹⁾ Historic aspects are the particular features of the historic site, building or facility that gives it its historic significance, such as historic background, noteworthy architecture, unique design, works of art, memorabilia, and artifacts.

²⁾ Historic fabric consists of the original materials and portions of the building intact when exposed or as they appeared and were used in the past.

³⁾ Historic buildings are buildings and facilities that are eligible for listing or are listed in the National Register of Historic Places, or such properties designated as historic under a statute of the appropriate state or local government body.

ed on an area near the door itself (see power assisted door).

circulation path: Examples include walks, hallways, courtyards, stairways, and stair landings.

common use: These are the spaces and elements that are made available for the use of residents of an apartment building, the occupants of an office building, or the guests of such residents or occupants.

dwelling unit: A single-family home is a dwelling unit, and dwelling units are to be found in such housing types as townhouses and apartment buildings.

element: Examples of elements are telephones, curb ramps, doors, drinking fountains, seating, and water closets.

housing: Examples are one- and two-family dwellings, multifamily dwellings, group homes, hotels, motels, dormitories, and mobile homes.

operable part: Examples of operable parts are telephone coin slots, push buttons, and handles.

parking space: This includes parking spaces that are located in parking garages, on streets and in lots.

power-assisted door: The power assist is provided

upon the activation of a switch or the use of continued force applied to the door itself. If the switch or door is released, such doors immediately begin to close or close completely within 3 to 30 seconds (see automatic door).

public use: Public use is often provided at a building or facility that is privately or publicly owned.

site improvements: This includes features such as landscaping, pedestrian and vehicular pathways, outdoor lighting, and recreational facilities.

sleeping accommodations: Dormitories and hotel or motel guest rooms are examples.

telecommunications device for the deaf (TDD): TDD's include telecommunications display devices, telecommunication devices for deaf persons, text telephones or computers.

temporary: Examples are temporary classrooms or classroom buildings at schools and colleges. Other examples are movable facilities at the perimeter of a major construction site to permit accessible and safe passage past the site. Structures directly associated with the actual processes of major construction, such as portable toilets, scaffolding, rigging, and trailers are not included.

vehicular way: Examples are streets, driveways, and parking lots.

Table A2.3(a) – Maximum Slopes

Maximum Slope	Maximum Rise	Maximum Run
1:9	16 in (405 mm)	12 ft (4 m)
1:6	4 in (100 mm)	2 ft (2 m)

Table A2.3(b) – Nominal Minimum Door Leaf Widths

Min Corridor/Room	Min Door Leaf Width
36 in (915 mm)	34 in (865 mm)
40 in (1015 mm)	32 in ¹⁾ (815 mm)
¹⁾ When the door provides 31 in (785 mm) clear opening in its full open position.	

walk: This includes general pedestrian areas such as plazas and courts.

A4.2 Space Allowances and Reach Ranges

A4.2.1 Wheelchair Passage Width

Space Requirements for Wheelchairs. Most wheelchair users need a 30-in (760 mm) clear opening width for doorways, gates, and other openings, when the latter are entered head-on. Greater clear widths are needed if the wheelchair user is unfamiliar with a building, if competing traffic is heavy, if sudden or frequent movements are needed, or if the wheelchair is turned at an opening. For most situations the addition of an inch of leeway on either side is sufficient. Thus, a minimum clear width of 32 in (815 mm) provides adequate clearance. However, if an opening or a restriction in a passageway is more than 24 in (610 mm) long, it is essentially a passageway and is 36 in (915 mm) wide minimum.

Although people who use walking aids do maneuver through clear width openings of 32 in (815 mm), they need passageways and walks that are 36 in (915 mm) wide for a comfortable gait. Crutch tips, often extending down at a wide angle, are a hazard in narrow passageways where they are not seen by other pedestrians.

Able-bodied people in winter clothing, walking straight ahead with arms swinging, need 32 in (815 mm) of width, which includes 2 in (51 mm) on either side for sway, and another 1-in (25-mm) tolerance on either side for clearing nearby objects or other pedestrians. Almost all wheelchair users and those who use walking aids also manage within this 32-in (815-mm) width for short distances. Thus, two streams of traffic pass in 64 in (1625 mm) of width in a comfortable flow. Sixty inches (1525 mm) provides a minimum width for a somewhat more restricted flow. If the clear width is less than 60 in (1525 mm), two wheelchair users are not able to pass but have to seek a wider place for passing.

Forty-eight inches (1220 mm) is the minimum width needed for an ambulatory person to pass a nonambulatory or semiambulatory person. Within this 48-in (1220-mm) width, the ambulatory person has to twist to pass a wheelchair user, a semiambulatory person, or a person with a seeing eye dog. There is little leeway for swaying or missteps. See Fig. BA4.2.1.

A4.2.3 Wheelchair Turning Space. This standard specifies a minimum space of 60-in (1525-mm) diameter for a pivoting 180-degree turn of a wheelchair. This space is satisfactory for turning around, but many people are not able to turn without repeated tries and bumping into surrounding objects. The space shown in Fig. BA4.2.3 allows most wheelchair users to complete U-turns without difficulty.

A4.2.4 Clear Floor or Ground Space for Wheelchairs. The wheelchair and user shown in Fig. BA4.2.4 represent typical dimensions for a large adult male. The space requirements in this standard are based upon maneuvering clearances that accommodate most large wheelchairs. Fig. BA4.2.4 provides a uniform reference for design not covered by this standard.

A4.2.6 Side Reach. For the wheelchair user to reach to a height of 54 in (1370 mm) from the side of the wheelchair, the user must be able to maneuver the wheelchair clear floor space within 10 in (255 mm) horizontally of the object to be reached.

A4.3 Accessible Route

A4.3.1 General. Walks, paths, halls, corridors, aisles and other elements and spaces are part of an accessible route.

Travel Distances. Many disabled people move at only very slow speeds; for many, traveling 200 ft (61 m) takes about 2 minutes. This assumes a rate of about 1 1/2 ft/s (455 mm/s) on level ground. It also assumes that the traveler moves continuously. However, on trips over 100 ft (30 m), some people with disabilities rest frequently, which substantially increases their trip times. Resting periods of two minutes for every 100 ft (30 m) are used to estimate travel times for people with severely limited stamina. In inclement weather, slow progress and resting greatly increase a person with a disability to exposure to the elements.

Level, indirect routes or those with running slopes less than 1:20 provide more convenience than direct routes with maximum allowable slopes or with ramps.

A4.3.3 Width. It is much more difficult for a wheelchair user to negotiate a U-turn (half-circle turn) around a narrow obstacle than to make two right-angle turns separated by a distance of 48 in (1220 mm) minimum. The access route therefore is to be wider if the wheelchair user negotiates a turn around a narrow obstacle.

A4.3.4 Passing Space. The intersections of two walks, paths or corridors are considered passing spaces.

A4.3.9 Egress. An area of refuge has a temporary use during egress. It serves as a staging area which provides relative safety to its occupants while potential emergencies are assessed, decisions are made, and mitigating activities are begun. Refuge is thus a stage of the total egress process, a stage between egress from the immediately threatened floor area and egress, including assisted egress, by some route to the public way.

An area of refuge is another building connected by a bridge or balcony, a compartment of a subdivided story, a protected elevator lobby, or an enlarged exit stair landing. The path of egress travel from an area of refuge to the public way frequently involves supervised or assisted use of elevators or stairs. The use of elevators for egress, especially during emergency conditions, is not an approach to be taken without considerable planning, ongoing effort, and a high degree of understanding on the part of everyone involved. Because of dangers in the use of elevators during fire or other emergencies, their use is to be supervised by trained personnel using procedures in accordance with ASME/ANSI A17.1, Safety Code for Elevators and Escalators. Elevators also have limited capacity and there are conflicting demands of other activities such as firefighting. Similarly, there are assistance requirements, dangers, capacity limitations, and conflicting demands in the use of stairs as a means of egress from an area of refuge.

To facilitate an adequate degree of understanding about the use of areas of refuge and about the associated assisted egress procedures, information should be provided to those using the facilities. The exact content of the information, its format (e.g., as a set of instructions), its distribution (e.g., either posted in the area of refuge or otherwise transmitted to users) must be determined on a case-by-case basis. The information must be tailored to the specific facility, its emergency plan, and the intended audience.

A4.3.10 Handrails. The requirements for handrails in this standard are for adults and children five years of age and older. When children under five years of age are major users of a building or facility, an additional, lower handrail is useful especially if it has a smaller size to accommodate children's smaller hands which have a smaller grip diameter that ranges from 1 in to 1.3 in (25 mm to

33 mm). For children up to about eight years of age, it is suggested that the handrail diameter not exceed the 1 1/4 in (32 mm) minimum permitted for required handrails. For children of up to age 12, the handrail diameter should not exceed 1 3/4 in (45 mm). Alternatively, especially for younger children, suitably sized and spaced vertical pickets can provide a handhold at whatever height a child may choose. Children apparently prefer to use, and can more effectively use, handrails or other graspable elements that are located at shoulder to head height. This is because of their developmental characteristics and their less-developed balance and walking abilities. Additional, secondary handrails at a height in the range of 28–34 in (710–865 mm) may be useful for the youngest stair users up to about three years of age, including some who would be best prevented from using stairs without close adult supervision. Handrail heights between 32–38 in (815–965 mm) may be useful for children in the three to five age range. These suggestions are preliminary pending further study of children's use of stairs and handrails.

A4.3.11 Handrail Terminations and Extensions.

Handrail details such as horizontal extensions and continuity at turns are useful for all users. Handrail extensions are especially needed by persons who wear leg braces or have similar disabilities. Such people use the handrail to balance themselves as they make the transitions between the stepped or sloping surfaces and the landings. Bending the handrail extension at 90 degrees to the direction of travel puts the extension out of reach and defeats its purpose. Continuous, inside handrails on switchback or dogleg stairs can indicate to the person with a visual impairment that another stair flight begins immediately after the turn. The continuous, inside handrail is not recommended to have segments with a slope that differs from the slope of the stairs.

The most critical transition from level walking to stair use is at the top of a flight. One should be able to reach and grasp the handrail(s) in advance of attempting the very critical, first descent step. Therefore, requirement 4.3.11.2 is presented as a safety convention useful for all users and as an additional aid for those with perceptual or mobility disabilities.

A less critical but still important transition is at the bottom of a stair flight. With requirement 4.3.11.3 continuation of the handrail, at stair flight slope for the horizontal equivalent of one tread at the land-

ing, means that a person's hand will find the end of (this portion of) the handrail at about the same instant as the leading foot contacts the landing surface. Either a termination (with a return) or a horizontal extension is suitable at this point.

Requirement 4.3.11.4 essentially says that the bottom landing horizontal extension is only required where it is possible to provide it in relation to a wall or a guard.

A4.4 Protruding Objects.

Guide dogs are trained to recognize and avoid hazards. However, most people with severe impairments of vision use the long cane as an aid to mobility. The customary cane technique is where the cane arcs from side to side and touches points outside both shoulders.

Potentially hazardous objects may be detected by long cane users if they fall within the detection range of canes. See Fig. BA4.4. Visually impaired people walking toward an object detect an overhang if its lowest surface is no higher than 27 in (685 mm). When walking alongside protruding objects, they do not detect overhangs. Because of imperfect forward protection provided by the long cane and individual variations in how people use their canes, detection of protruding objects is not assured. Individuals with low vision may have poor acuity or depth perception and can not reliably see low lying protruding objects.

A4.5 Ground and Floor Surfaces

A4.5.1 General. Ambulant and semiambulant people who have difficulty maintaining balance and those with restricted gaits are particularly sensitive to slipping and tripping hazards. For such people, a stable and regular surface is necessary to walk safely. Wheelchairs are propelled most easily on surfaces that are hard, stable, and regular. Soft, loose surfaces such as shag carpet, loose sand, gravel, crushed stone or wet clay, and irregular surfaces such as cobblestone, significantly impede movement of a wheelchair.

Slip resistance is based on the frictional force necessary to keep a shoe or crutch tip from slipping on a walking surface under the conditions of use likely to be found on the surface. Although it is known that the static coefficient of friction is one basis of slip resistance, there is not as yet a generally accepted method to evaluate the slip resistance of walking surfaces for all use conditions.

Cross slopes steeper than 1:48 on walks and ground or floor surfaces cause considerable difficulty in propelling a wheelchair in a straight line.

A4.5.2 Changes in Level. As used in the standard, a "change in level" is a change in the elevation of a walking surface. For changes in level greater than 1/2 in (13 mm), 4.5.2.3 should not be construed as prohibiting the use of a walking surface with a slope of 1:20 maximum to accomplish a change in elevation. As indicated in 4.3.2.1, an accessible route is permitted to slope 1:20 maximum. When so sloped, a change in elevation naturally occurs. Such changes in elevation are not intended to be subject to 4.5.2.

A4.5.3 Carpet. Much more is to be done in developing both quantitative and qualitative criteria for carpeting. However, certain functional characteristics are well established. When both carpet and padding are used, it is desirable to have minimum movement (preferably none) between the floor and the pad and the pad and the carpet, which would allow the carpet to hump or warp. In heavily trafficked areas, a thick, soft (plush) pad or cushion, particularly in combination with long carpet pile, makes it difficult for individuals in wheelchairs and those with other ambulatory disabilities to get about. This does not preclude their use in specific areas where traffic is light. Firm carpeting is achieved through proper selection and combination of pad and carpet, sometimes with the elimination of the pad or cushion, and with proper installation.

A4.6 Parking Spaces and Passenger Loading Zones

A4.6.1 General. Parking spaces designated for people with physical disabilities and accessible passenger loading zones that serve a particular building are recommended to be located on the shortest possible accessible circulation route to an accessible entrance of the building. In separate parking structures or lots that do not serve a particular building, parking spaces for a person with a physical disability are recommended to be located on the shortest possible circulation route to an accessible pedestrian entrance of the parking facility.

A4.6.2 Parking Spaces. Signs designating parking spaces for a person with a physical disability are seen from a driver's seat if the signs are mounted high enough above the ground and located at the front of a parking space.

A4.6.4 Van Parking Space. A side lift that loads perpendicular to the van requires an aisle that is 96 in (2440 mm) wide.

A4.8 Ramps

A4.8.1 General. Ramps are essential for wheelchair users if elevators or lifts are not available to connect different levels. However, some people who use walking aids have difficulty with ramps and prefer stairs.

A4.8.2 Slope and Rise. The least possible slope should be used for any ramp. The ability to manage an incline is related to both its slope and its length. Wheelchair users with disabilities affecting arms or with low stamina have serious difficulty using inclines. Most ambulatory people and most people who use wheelchairs manage a slope of 1:16. Many people do not manage a slope of 1:12 for 30 ft (9 m). Many people who have difficulty negotiating very long ramps at relatively shallow slopes manage very short ramps at steeper slopes. Ramps are recommended to be straight, not curved, unless engineering analysis has been performed to ensure that the slope of the curved ramp is not steeper than 1:12 anywhere along the line of traffic. It is necessary to ensure that all four wheels of a wheelchair remain in contact with the ramp surface at all times. See A4.8.6 also.

Movement either up or down the ramp slopes permitted for the historical alternative discussed in A2.3.2 requires wheelchair users to have exceptional strength and stamina or skilled assistance or both. In addition, ambulatory users encounter unusual safety problems unless compensating features, beyond those required by this standard, are provided.

A4.8.6 Cross Slope and Surfaces. A curved ramp is likely to have a difference in elevation from inside to outside of the curve which creates a cross slope steeper than 1:48, and a doubly curved surface on which only three of the four wheels of a wheelchair rest at any one time. Dangerous handling problems are therefore created for the wheelchair user. See A4.8.2 also.

A4.10 Elevators

A4.10.1.5 Tactile Signage on Hoistway Entrances. Plates that have the appropriate raised characters are acceptable provided the

plates are permanently fixed to the hoistway entrance jambs.

A4.10.1.6 Door Protective and Reopening Device. The required door reopening device holds the door open for 20 seconds if the doorway remains obstructed. After 20 seconds, the door begins to close. However, if designed in accordance with ASME/ANSI A17.1, the door closing movement is still stopped if a person or object exerts sufficient force at any point on the door edge.

Owing to the kinetic nature of the motion, reversal of the closing door is not instantaneous. Until the continued movement of the door is arrested, it is possible that limited movement of the door causes it to come in contact with a person or object in its path.

A4.10.1.7 Door and Signal Timing for Hall Calls. This subsection allows variation in the location of call buttons, advance time for warning signals, and the door-holding period used to meet the time requirement. Examples of the application of this provision are shown in Fig. BA4.10.1.7.

A4.10.1.9 Inside Dimensions of Elevator Cars. See Fig. BA4.10.1.9 for one example of acceptable elevator car dimensions. Elevator car floor plans that may meet the intent of the criteria are available from: National Elevator Industry, Inc., 185 Bridge Plaza North, Room 310, Fort Lee, New Jersey 07024.

A4.10.1.12 Car Controls. Industry-wide standardization of elevator control panel design makes all elevators significantly more convenient for use by people with severe visual impairments.

In many cases, it is possible to locate the highest control on elevator panels within 48 in (1220 mm) from the floor.

Permanently applied plates that have the appropriate raised characters and symbols are an acceptable means of providing raised control designations.

A4.10.1.13 Car Position Indicators. A verbal announcement can serve as an audible signal and is preferred by persons with visual impairments and the general public. A non-verbal, audible signal is difficult to use in high rise buildings and when non-standard floor arrangements (e.g., basement, lobby, mezzanine, 2nd floor, ... 12th floor, 14th

floor, etc) are utilized.

A special button is sometimes provided that activates the audible signal within the given elevator only for the desired trip, rather than maintaining the audible signal in constant operation. The elevator industry recommends the button be identified by the symbol "S" and be located with, immediately above or immediately below the emergency buttons on the car operating panel.

A4.10.1.14 Emergency Communications. A device that requires no handset is easier to use by people who have difficulty reaching.

A4.12 Windows

Examples of the types of windows that are covered by this provision include double-hung and sliding windows plus casement and awning windows that do not have cranks.

A4.13 Doors

A4.13.8 Thresholds at Doorways. Thresholds and changes in surface height in doorways are particularly inconvenient for wheelchair users who also have low stamina or restrictions in arm movement, because complex maneuvering is required to get over the level change while operating the door.

A4.13.9 Door Hardware. Some people with disabilities are unable to grasp objects with their hands or twist their wrists. Such people are unable to or have great difficulty in operating door hardware other than lever-operated mechanisms, push-type mechanisms, and U-shaped handles.

A4.13.10 Door Closers. Closers with delayed action features give a person more time to maneuver through doorways. They are particularly useful on frequently used interior doors. When used on fire doors, the closer is recommended to be adjusted so that the delay does not exceed requirements established by the administrative authority. Spring hinges are not considered door closers that would have to comply with the closing speed criteria.

A4.13.11 Door-Opening Force. Although some people with disabilities are unable to exert the maximum allowable force to open the door, as given in this subsection, these forces are the minimum practical forces to permit the door closers to function. Door closers have certain minimum closing forces to close doors satisfactorily. Opening forces are measured with a spring scale as follows:

1. **Hinged Doors.** Apply force perpendicular to the door at the actuating device or 30 in (760 mm) from the hinged side, whichever is the farthest from the hinge.

2. **Sliding or Folding Doors.** Apply force parallel to the door at the door pull or latch.

3. **Application of the Force.** Apply force gradually so that the applied force does not exceed the resistance of the door. Air-pressure differentials, especially in high-rise buildings, have an adverse effect on door-opening force. Accessible openings located in these areas sometimes require modification of this subsection or possibly the use of automatic or power-assisted doors to comply with allowable forces given.

Forces to operate a door involve more than a simple single operation. For example, doors that are latched are unlatched by a force that consists of depressing a lever or applying a direct force. The additional force to overcome the inertia of a door exceeds that required to maintain movement of the door. In general, only a momentary auxiliary force is recommended to be permitted to exceed the force given in 4.13.11.

A4.13.14 Door Surface. Some persons with disabilities push against doors with their chairs or walkers to open them. Applied kickplates on doors with closers reduce required maintenance by withstanding abuse from wheelchairs and canes. To be effective, they cover the door width, less approximately 2 in (51 mm), up to a height of 12 in (305 mm) from the bottom edge and be centered across the top.

A4.15 Drinking Fountains and Water Coolers

A4.15.1 General. This Section is not intended to cover bottle type water coolers which generally rely on paper cups and are not permanently piped.

A4.15.2.1 Height. Commercially available drinking fountains having two spouts at varying heights are ideally suited both for people in wheelchairs and people who find it difficult or awkward to bend low. One spout adheres to the 36-in (865 mm) height; the recommended height for the higher spout is 42 in (1070 mm), measured from the floor.

A4.15.2.2 Location. If the spout is located lower or farther forward or both, the maximum distance from the front edge becomes less critical. Front edge is the basin edge, not the controls.

A4.16 Toilet Rooms, Bathrooms, Bathing Facilities, and Shower Rooms

A4.16.2 Doors. When a door opens into a bathroom, sufficient maneuvering space is provided within the room for a person using a wheelchair to enter, close the door, use the fixtures, reopen the door, and exit without undue difficulty.

A4.16.3 Clear Floor Space. The wheelchair maneuvering space overlaps the required clear floor spaces at fixtures and extends under the lavatory 19 in (480 mm) maximum because knee space is provided. However, because toe or knee space is not available at the toilet, the wheelchair maneuvering space is clear of the toilet. Design and location of floor drains should not impede the use of plumbing fixtures.

A4.16.5 Medicine Cabinets. Other methods for storing medical and personal care items are very useful to people with physical disabilities. Shelves, drawers, and floor-mounted cabinets are provided within the reach ranges of a person with a disability.

A4.16.6 Mirrors. If mirrors are to be used by both ambulatory people and wheelchair users, then they are 74 in (1880 mm) high minimum at their topmost edge. A single full-length mirror accommodates all people, including children.

A4.17 Water Closets

A4.17.2 Clear Floor Space. The required 48 in (1220 mm) in front of the water closet equates to a room dimension of 75 in (1905 mm) for conventional flush, valve operated fixtures and 79 in (2005 mm) for tank type fixtures.

A4.17.3 Height. Preferences for the heights of toilet seats vary considerably among persons with disabilities. Higher seat heights are an advantage to some ambulatory persons with disabilities but a disadvantage for some wheelchair users and others. Toilet seats that are approximately 17 to 19 in (430 to 485 mm) high is a reasonable compromise. Seats and filler rings of various thicknesses are available to adapt china-fixture rims, which vary from 14 to 18 in (355 to 455 mm) high, to these requirements.

A4.17.4 Grab Bars. Fig. BA4.17.4 shows the diagonal and side approaches used to transfer from a wheelchair to a water closet. Some wheelchair users transfer from the front of the toilet, while others use a 90-degree approach. Most people who

use these two additional approaches also use either the diagonal approach or the side approach.

A4.17.5 Flush Controls. Flush valves and related plumbing are sometimes located behind walls or to the side of the toilet, or a toilet seat lid can be provided if plumbing fittings are directly behind the toilet seat. Such designs reduce the chance of injury and imbalance caused by leaning back against the fittings. Flush controls for tank-type toilets have a standardized mounting location on the left side of the tank (facing the tank). Tanks are available by special order with controls mounted on the right side; their use facilitates compliance with the standard. If administrative authorities require flush controls for flush valves to be located in a position that conflicts with the location of the rear grab bar, then that bar may be split or shifted toward the wide side of the toilet area.

A4.18 Toilet Stalls

A4.18.3 Wheelchair Accessible Stalls. The 60 in (1525 mm) wide toilet stall effectively serves most wheelchair users. The minimum width toilet stall that serves wheelchair users is 48 in (1220 mm). Alternate wheelchair stalls may be permitted by the administrative authority in new construction where a conforming wheelchair accessible stall is also provided, and in existing construction where a conforming wheelchair accessible stall can not be used without significant structural alteration. Minimum dimensions of the alternate stall are 48 in (1220 mm) wide and 66 in (1675 mm) deep for wall hung water closets and 69 in (1755 mm) deep for floor mounted water closets. See Fig. BA4.18.3. A wheelchair accessible stall less than 48 in (1220 mm) wide does not effectively serve most wheelchair users and should not be permitted.

A4.18.4 Ambulatory Accessible Stalls. A 36 in (915 mm) wide toilet stall with a grab bar on each side wall effectively serves people with balance problems or ambulatory disabilities who need to support themselves.

A4.18.7 Coat Hooks and Shelves. Measurements are to be taken to the top of the shelf or coat hook.

A4.19 Urinals

If sufficient water closets, accessible and nonaccessible, are provided to satisfy code requirements, the installation of an accessible urinal is discretionary.

A4.20 Lavatories and Sinks

A4.20.2.1 Lavatories. Built-in lavatories in countertops should be placed as close as possible to the front edge of the countertop.

A4.20.4 Exposed Pipes and Surfaces. Water supply and drain pipes, where they come in contact with the users limbs, are insulated or otherwise treated to prevent contact with the legs of wheelchair users because cold causes muscle spasms and heat burns the legs that do not have functioning nerves. Moreover, contact with the pipes causes cuts and bruises.

A4.20.5 Faucets. Conventional one-quarter-turn, lever-operated, push-type, and automatically controlled mechanisms are examples of acceptable designs.

A4.21 Bathtubs

A4.21.3 Seat. The built-in seat at the head end of the tub is a transfer surface for people to sit on while transferring down into the tub. See Fig. B4.21.2(b).

A4.22 Shower Stalls

A4.22.1 General. The recommended shower stalls are for independent use by an individual. Stalls between the two recommended sizes do not effectively serve disabled persons who wish to use a shower without assistance.

A4.22.2.1 Transfer-Type Showers. Shower stalls that are 36 by 36 in (915 by 915 mm) wide provide additional safety to people who have difficulty maintaining balance because all grab bars and walls are within easy reach. Seated people use the walls of these showers for back support.

The shower stall with inside finish dimensions of 36 by 36 in (915 by 915 mm) has been designated a transfer-type stall to indicate that wheelchair users can transfer from their chair to the required seat. The shape of the seat provides support when the user's back is placed in the corner for support while using the shower. The seat is required to be essentially the full depth of the stall; it must be flush with the front edge of the seat wall to minimize the distance between the seat and the wheelchair so as to facilitate a transfer. The seat wall must be free of grab bars to allow a person to slide onto the seat and a portion of the adjacent back wall must be without a grab bar so the person's back can be placed against the walls for support.

The 36 by 36 in (915 by 915 mm) dimensions will allow a person of average size to reach and operate the controls without difficulty, while providing reasonable knee space for larger users. A transfer-type shower stall is also intended to serve persons without disabilities so a folding seat would provide more space for a standing person. Rounding of corners as necessitated in the manufacture of prefabricated shower stalls does not interfere with use. Typically, the dimensions would be measured at the center of the walls rather than at the corners.

A threshold with a 1/2 in (13 mm) maximum height will help reduce the amount of water that will reach the bathroom floor while allowing the front wheels of many wheelchairs access to the shower stall. There are wheelchairs that have very small wheels which can not be moved easily, or in some instances safely, over a threshold.

A4.22.2.2 Roll-in Type Showers. A 30 in (760 mm) minimum width is acceptable when alterations are made, since the shower stall in Fig. B4.22.2 will fit into the space commonly provided for a bathtub. In new construction, the preferred minimum width is 36 in (915 mm). Three grab bars can be used in lieu of the single, wraparound grab bar depicted in Fig. B4.22.2.2.

A4.22.3 Seat. Either a fixed or a folding seat is permitted. The seat is required to be "L" shaped so the user can get the additional stability provided by the adjacent walls.

A4.22.6 Shower Unit. In facilities where vandalism causes a maintenance problem, such as in isolated or unmonitored areas, a fixed shower head is used in lieu of a hand-held shower head. The fixed shower head is mounted 48 in (1220 mm) above the shower floor.

A4.23 Storage

A4.23.4 Hardware. Touch latches and U-shaped pulls are acceptable.

A4.24 Grab Bars, and Tub and Shower Seats

A4.24.1 General. Many people with disabilities rely heavily upon grab bars to maintain balance and prevent serious falls. Many people brace their forearms between supports and walls to give them more leverage and stability in maintaining balance or for lifting. The grab bar clearance of 1 1/2 (38 mm) required in this standard is a safety clearance to prevent injuries from arms slipping through the opening. This clearance also provides a minimum space for gripping.

A4.24.2.5 Method of Mounting. Grab bars that are wall mounted do not affect the measurement of required clear floor space where the space below the grab bar is clear and does not present a knee space encroachment as provided in 4.2.4.3. However, a floor mounted grab bar system, depending on the specific configuration, may encroach on knee space and would affect how required clear floor space is measured. This requirement is included to ensure that the grab bar installation does not obstruct the required clear floor space. Retractable grab bars which meet structural requirements may be considered equivalent.

A4.25 Operable Parts of Equipment and Appliances

A4.25.1 General. Examples of operable parts that are within the scope of this provision include light switches, dispenser controls, electrical receptacles and communications system receptacles.

The nature of certain specialized communication equipment and similar equipment precludes installation at the specified locations. Such equipment is then located as close as is feasible to the reach range.

A4.25.3 Height. All of a control, receptacle, or other operable part is to be within the specified reach ranges.

A4.26 Alarms

A4.26.1 General. The specifications in this section do not preclude the use of zoned or coded emergency alarm systems. In zoned systems, the visual alarm signals in an area flash whenever an audible signal sounds in the area. The standards regarding visual alarm signals provide comparable coverage and protection for persons with hearing impairments as well as for those depending on audible alarms. The provisions in this section for visual alarm signals were derived from research on facilities not designed for sleeping, e.g., business occupancies. In sleeping rooms additional methods for awakening sleeping persons who have hearing impairments are necessary.

A4.26.2 Audible Alarm Signals. Audible emergency signals are to have an intensity and frequency that attract the attention of individuals who have partial hearing loss. People over 60 years of age generally have difficulty perceiving frequencies higher than 4,000 Hz.

A4.26.3 Visible Signaling Appliances. In zoned systems, the emergency exit lights in an area flash whenever an audible signal rings in the area. The color of visual signaling appliances is clear (i.e., unfiltered or clear filtered) white light. These specifications preclude the use of "xenon" type lamps used in motion picture projection equipment. In planning for appliance placement, care is taken not only to observe the minimum requirements given here, but to optimize appliance effectiveness. For example, in a large work area, an individual employee more than 50 ft (15 m) from a visible signaling appliance does not receive light of the recommended intensity. It is recommended that the work space be organized so that any hearing impaired occupant has his or her work area as close to the visible signaling appliance as feasible. For odd-shaped rooms, the appliance(s) is placed so as to illuminate, directly or by reflection, all spaces in the room where partitions may block a signal. See Fig. BA4.26.3(a) and (b). Normally, appliances are wall mounted to achieve reflectance from the ceiling.

An example of using Table 4.26.3.2.1 for maximum room size determinations with a non-centered visible signaling appliance location is shown in Fig. BA4.26.3(c). In this example, the visible signaling appliance is mounted 20 ft (6 m) from the farthest adjacent wall in a 30 ft by 30 ft (9 m by 9 m) room. The maximum room size calculated in accordance with 4.26.3.2.1 and Table 4.26.3.2.1 is, therefore, 20 ft (6 m) by 2 equals 40 ft by 40 ft (12 m by 12 m). This would require that a 60 candela appliance be installed.

When more than one visible signaling appliance is installed in a room in accordance with Table 4.26.3.2.1, each appliance should be located so as to maximize its area of coverage, while minimizing overlapping coverage with other appliances. See Fig. BA4.26.3(d), (e) and (f) for examples of correct and incorrect location of a 15 candela visible signaling appliance on each wall of a 40 ft by 40 ft (12 m by 12 m) room. Refer also to NFPA Standard 72 (to be published in 1993), Chapter 6, for additional information on locating visible signaling appliances.

In accessible sleeping accommodations or other rooms where people with hearing impairment might work or reside, locate visible signaling appliances to ensure they will be seen by the intended viewers regardless of their orientation to the appliance. The amount of light usually necessary to awaken a sleeping deaf person is an effective in-

tensity of 110 candela. However, this is as high as 177 candela if smoke obscures the intensity of the warning light. Incandescent light bulbs are not considered effective. Additional rooms beyond those accessible to wheelchair users are recommended to be equipped with emergency visible signaling appliances.

In rooms which are less than 60 ft by 60 ft (18 m by 18 m), the use of more than one visible signaling appliance may trigger photo sensitive epilepsy. The minimum number of appliances should be used to cover the space.

A4.27 Detectable Warnings - Standardization

Recognition of, and quick response to, detectable warnings is maximized by standardization of material as well as surface texture and color. Provision of too many detectable and tactile warnings or failure to standardize such warnings weakens their usefulness. Detectable and tactile warnings are also visual signals to guide dogs, since dogs are trained to respond to a large variety of visual cues.

A4.28 Signage

A4.28.1 General. Much of the information in 4.28 was developed to assist the large number of people who are visually impaired but have some residual sight. In building complexes where finding locations independently on a routine basis is a necessity (for example, college campuses), tactile maps or prerecorded instructions are very helpful to visually impaired people. Several maps and auditory instructions have been developed and tested for specific applications. The type of map or instructions used are based on the information to be communicated, which depends highly on the type of buildings or users. Tactile signage is used where permanent signs identify the following rooms and spaces.

- Hotel guest rooms
- Tenant space entrances
- Entrances to apartment units
- Patient rooms in medical facilities
- Classrooms and offices in schools and colleges
- Common use areas
- Rest rooms
- Areas of refuge

Landmarks easily distinguished by visually impaired individuals are useful as orientation cues. Such cues include changes in illumination level, bright colors, unique patterns, wall murals, location of special equipment, or other architectural features (for example, an exterior view).

Many people with disabilities have limitations in movement of their head and reduced peripheral vision. Thus, signage positioned perpendicular to the path of travel is easiest for them to notice. People generally distinguish signage within an angle of 30 degrees to either side of the centerline of their face without moving their head.

A4.28.2 Character Proportion. The legibility of printed characters is a function of viewing distance, character height, the ratio of the stroke width to the height of the character, the contrast of color between character and background, and print font.

A4.28.3 Character Height. The size of characters is based upon the intended viewing distance. Sans serif typefaces or a simple serif typeface without excessive flourishes or deviation in stroke width have been found to be the most legible. A severely nearsighted person has to be much closer to see a character of a given size accurately than a person with normal visual acuity.

A4.28.4 Pictograms. Pictograms which are understood by sighted persons are frequently not discernible or interpretable by visually impaired persons; therefore, pictograms are accompanied by tactile, text descriptors complying with 4.28.7.

A4.28.5 Finish and Contrast. An eggshell finish (11 to 19 degree gloss on 60 degree glossimeter) is recommended. Research indicates that signs are more legible for persons with low vision when characters contrast with their background by 70 percent minimum. Contrast, in percent, is determined by:

$$\text{Contrast} = [(B_1 - B_2)/B_1] \times 100$$

where B_1 = light reflectance value (LRV) of the lighter area

and B_2 = light reflectance value (LRV) of the darker area.

Note that in any application both white and black are never absolute; thus, B_1 never equals 100 and B_2 is always greater than 0. The greatest readability is usually achieved through the use of light-colored characters or symbols on a dark background.

A4.28.6 Tactile Characters or Symbols. Blind persons read either tactile characters or Braille; many of them do not read both. Therefore, tactile signs include both raised characters and Braille. Both tactile characters and Braille are most legible when the raised profile in cross-section (perpendicular to the face of the letter) is rounded or trapezoidal. Tactile characters and Braille having rectangular profiles are not as legible.

Grade II Braille is standard literary Braille in which numerous contractions shorten words. The standard dimensions for Braille (per Specification #800, National Library Service, National Library of Congress) are:

Nominal height.....0.019 in (0.5 mm)

Nominal base

diameter 0.057 in (1.5 mm)

Nominal distance

center to center

of adjacent dots

in same cell.....0.092 in (2.3 mm)

Nominal distance

center to center

of corresponding

dots in adjacent

cells 0.245 (6.2 mm)

Nominal line

spacing of Braille

cells center to

center of nearest

corresponding dots

in adjacent lines 0.400 in (10.2 mm)

A4.28.7 Location of Tactile Signage. In order to be useable by the visually impaired, tactile signs should be mounted in consistent locations. The latch side of single doors is preferred, as signs located at the hinge side are obscured when doors are open. In locations having double doors, tactile signs are mounted to the right of the right hand door, as it is approached. The signs should be mounted outside the swing of a door to preclude a person from being struck by a door and such that a person may approach within 3 in (75 mm) of the sign without encountering protruding objects.

Thus, visually impaired travellers following customary pedestrian traffic patterns by travelling to the right side of corridors or spaces encounter signs before they encounter the associated doors.

A4.28.8 Symbols of Accessibility. The international symbol of accessibility and appropriate directional signage are placed at inaccessible entrances indicating the direction to the nearest accessible entrance.

A4.29 Telephones

A4.29.3 Mounting Height. In localities where the dial-tone-first system is in operation, calls are placed at a coin telephone through the operator without inserting coins. The operator button is usually located at a height of 46 in (1170 mm) if the center of the coin slot of the telephone is at 54 in (1370 mm). All other operable parts are under the specified reach range. Measurements for reach limits are made to the center of the coin slot.

A generally available public telephone with a coin slot mounted lower on the equipment would allow universal installation of telephones at a height of 48 in (1220 mm) or less to all operable parts.

A4.30 Automatic Teller Machines

Access can be provided, for example, with simple tactile markings to orient fingers to the keypad, explained to users in a set of Braille or taped instructions handed to the user with the card. Output could be by voice synthesis through a jack accessed with headphones owned by the user.

A4.31 Seating, Tables, Work Surfaces, and Service Counters

A4.31.4 Height of Work Surfaces and Service Counters. The height of any type of counter, table, work surface and the like is related to the needs of the wheelchair user rather than an occupancy.

Different types of work require different work surface heights for comfort and optimal performance. Light detailed work, such as writing, requires a work surface close to elbow height for a standing person. Heavy manual work, such as rolling dough, requires a work surface height about 10 in (255 mm) below elbow height for a standing person. The principle of a high work surface for light detailed work and a low work surface for heavy manual work also applies for seated persons; however, the limiting condition for seated manual work is clearance under the work surface.

Table A4.31 - Convenient Heights of Work Surfaces for Seated People¹

Conditions of Use	Short Women		Tall Men	
	in	mm	in	mm
Seated in a wheelchair:				
Manual work:				
Desk or removable armrests	26	660	30	760
Fixed, full-size armrests ²⁾	32 ³⁾	815	32 ³⁾	815
Light, detailed work:				
Desk or removable armrests	29	735	34	865
Fixed, full-size armrests ²⁾	32 ³⁾	815	34	865
Seated in a 16-in (405 mm) high chair:				
Manual work	26	660	27	685
Light, detailed work	28	710	31	785
¹⁾ All dimensions are based on a work-surface thickness of 1 1/2 in (38 mm) and a clearance of 1 1/2 in (38 mm) between legs and the underside of a work surface. ²⁾ This type of wheelchair arm does not interfere with the positioning of a wheelchair under a work surface. ³⁾ This dimension is limited by the height of the armrests; a lower height would be preferable. Some people in this group prefer lower work surfaces, which require positioning the wheelchair back from the edge of the counter.				

Table A4.31 shows convenient work surface heights for seated persons. The great variety of heights for comfort and optimal performance indicates a need for alternatives or a compromise in height if both people who stand and people who sit are using the same counter area.

Service counters serve as duty stations for employees who require knee clearances and as temporary work surfaces for wheelchair users having a need to communicate or make transactions with personnel.

A4.32 Auditorium and Assembly Areas

A4.32.2 Size of Wheelchair Locations. Provision of a space large enough for two wheelchairs allows people who are coming to a performance together to sit together.

A4.32.3 Placement of Wheelchair Locations. The location of wheelchair areas is planned so that a variety of positions within the seating are provided. This allows choice in viewing and price categories.

A4.32.6 Placement of Listening Systems. For live oral presentations, seats within 50 ft (15 m) viewing distance of the stage or presentation area enable many persons with impaired hearing to

“speech read” the presenter’s facial expressions. For other presentations, not primarily oral, a greater viewing distance may be more desirable.

A4.33 Dwelling Units

A4.33.1 General. A person with a disability who lives in an accessible dwelling unit of a multifamily building or a housing project wants to participate in all on-site social activities, including visiting neighbors in their dwelling units. Hence, any circulation paths among all dwelling units and among all on-site facilities should be as accessible as possible. An accessible second exit in dwelling units provides an extra margin of safety in a fire.

The Fair Housing Amendments Act of 1988 requires a substantial number of minimally adaptable dwelling units (see regulations at 24 CFR 100.205 and accessibility guidelines at 24 CFR Ch. I, Subch. A, App. II).

In establishing administrative provisions as described in 2.0, administrative authorities specify the number of dwelling units to be fully adaptable or accessible, or procedures for determining the number to be fully adaptable or accessible, for different types of construction (i.e., new construction or remodeling or alterations). In addition, adminis-

trative authorities specify whether those fixtures for which height ranges are provided in 4.33.3 and 4.33.4 are to be permanently installed at a specific height or whether they are to be designed for adaptability.

A4.33.2 Adaptability. Adaptable dwelling units are particularly beneficial in rental housing where the demand for accessible units varies over time. Dwelling units designed for adaptability accommodate either able-bodied residents or residents having any of the disabilities described in 1.1, and have the further advantage of allowing the user to select the degree of accessibility that is desired. For example, an occupant chooses to have grab bars installed in the bathroom but prefers the standard-height counter and sink.

Where parking is provided for facilities with all dwelling units designed for adaptability, accessible parking spaces are provided according to the number and particular needs of the disabled residents occupying the adaptable units.

The subsections on bathrooms and kitchens specify a range of heights and clearances within which certain fixtures are installed (for example, grab bars at bathtubs and toilets, and work surfaces and sink heights in kitchens). In the case of grab bars, provision is made for later installation within the specified height range, as requested by the occupant of the dwelling unit. Other fixtures are permanently installed at a height within these ranges, or the fixtures are adjustable within the ranges.

A4.33.3 Bathrooms. Although not required by these specifications, it is important to install grab bars at toilets, bathtubs, and showers if it is known that a dwelling unit is to be occupied by elderly people or people with severe disabilities.

A4.33.4.5 Sink. Installing a sink with a drain at the rear so that plumbing is as close to the wall as possible provides additional clear knee space for wheelchair users.

A4.33.4.6 Ranges and Cooktops. Although not required for minimum accessibility, countertop range units in a counter with adjustable heights are an added convenience for wheelchair users.

A4.33.4.7 Ovens. Countertop or wall-mounted ovens with side-opening doors are easier for people in wheelchairs to use. Clear spaces 30 in (760 mm) wide minimum under counters at the side of ovens are an added convenience. The pull-out board or fixed shelf under side-opening oven doors

provides a resting place for heavy items being moved from the oven to a counter.

A4.33.4.8 Refrigerator/Freezers. Side-by-side refrigerator/freezers provide the most usable freezer compartments. Locating refrigerators so that their doors swing back 180 degrees is more convenient for wheelchair users.

A4.33.4.10 Kitchen Storage. Full-height cabinets or tall cabinets are recommended to be provided rather than cabinets mounted over work counters. Additional storage space located conveniently adjacent to kitchens makes up for space lost when cabinets under counters are removed.

Appendix B
(informative)

Illustrations

The figures contained in this Appendix are provided only to illustrate some of the criteria in the standard. They are not part of the standard and are not intended to introduce criteria that are not contained in the standard.

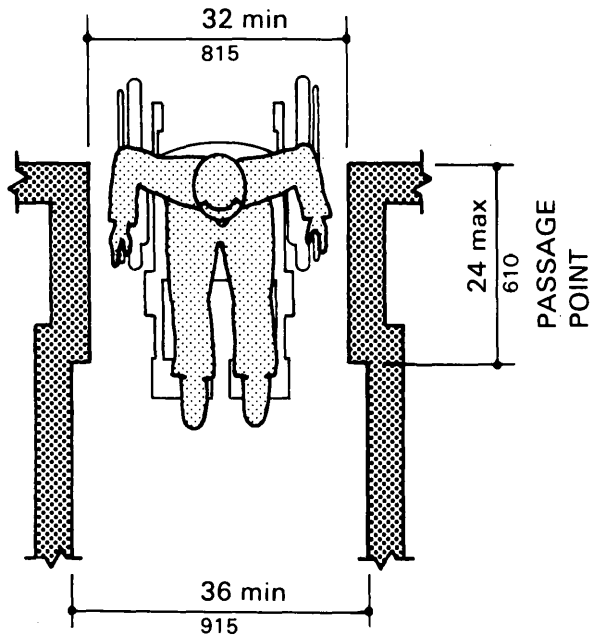


Fig. B4.2.1
Minimum Clear Width for Single Wheelchair

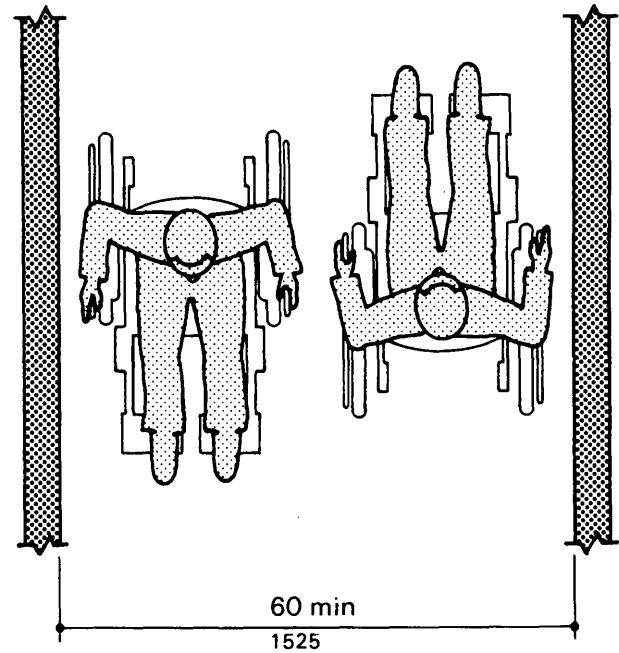
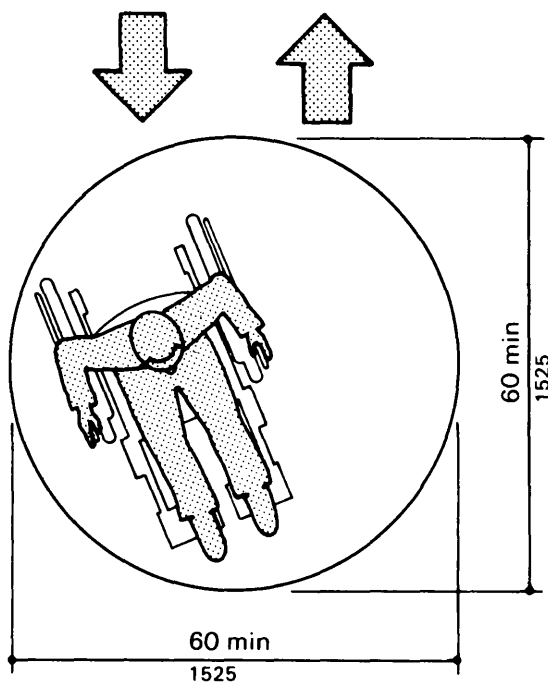
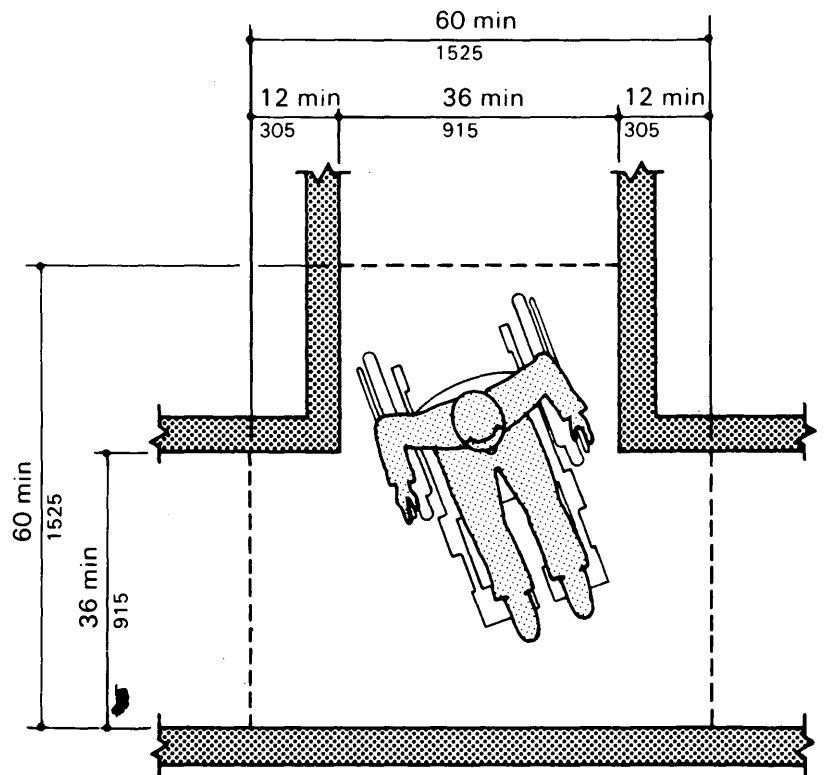


Fig. B4.2.2
Minimum Clear Width for Two Wheelchairs



(a) 60-in (1525-mm) Diameter Space



NOTE: Dashed lines indicate minimum length of clear space required on each arm of the T-shaped space in order to complete the turn.

(b) T-Shaped Space for 180° Turn

Fig. B4.2.3
Wheelchair Turning Space

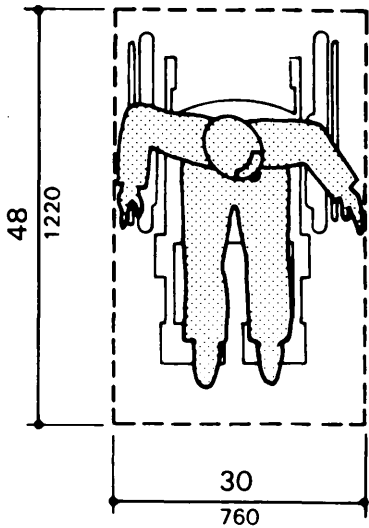


Fig. B4.2.4.1
Clear Floor Space for Wheelchairs

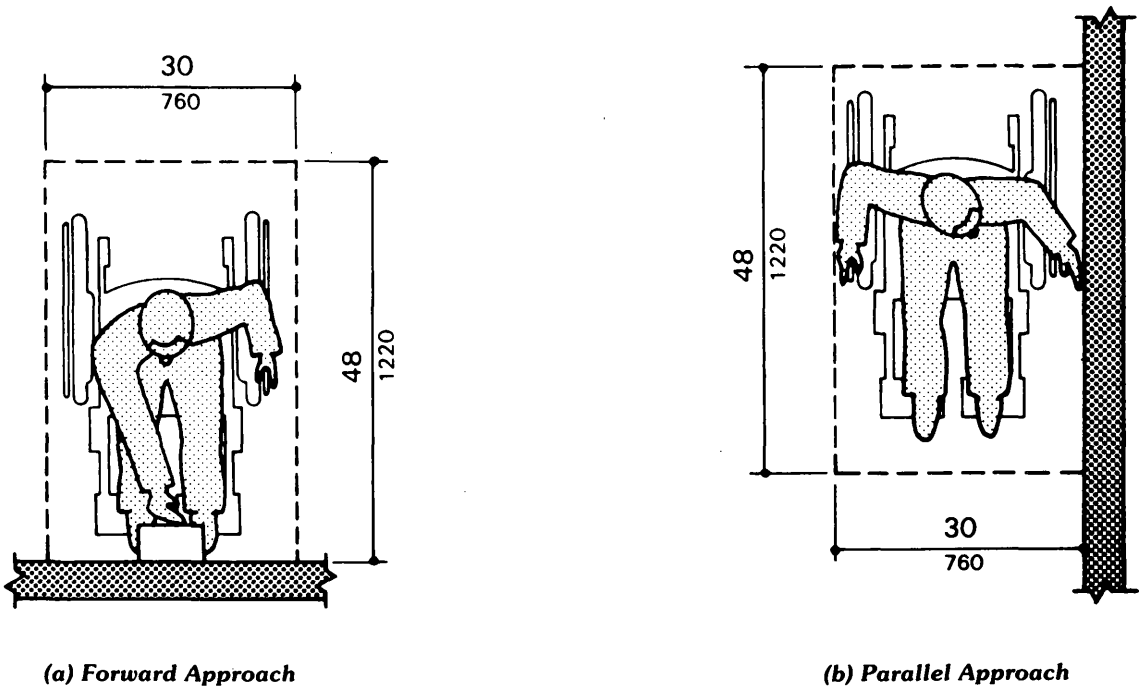


Fig. B4.2.4.2
Wheelchair Approaches

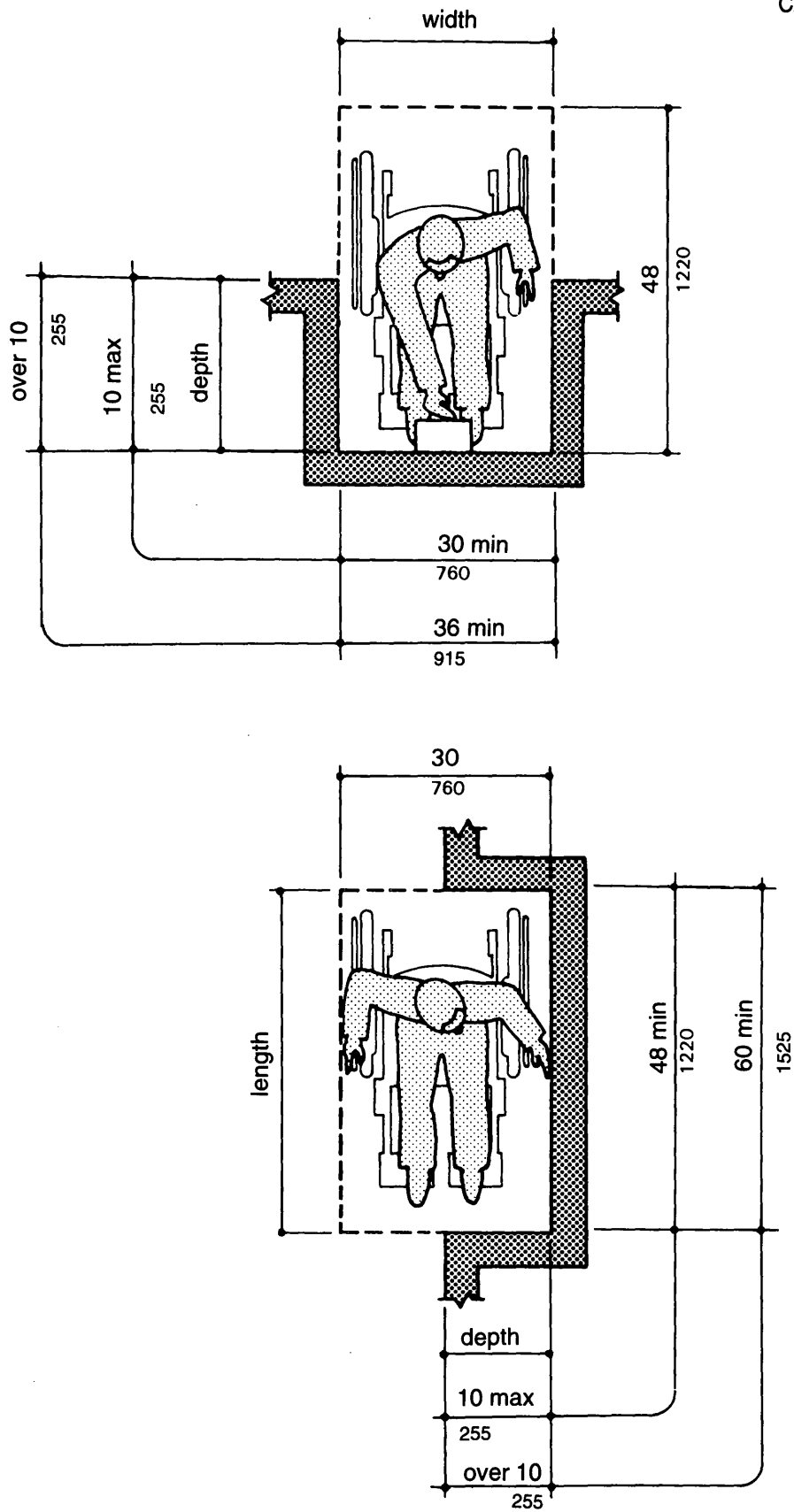


Fig. B4.2.4.4
Clear Floor Space in Alcoves

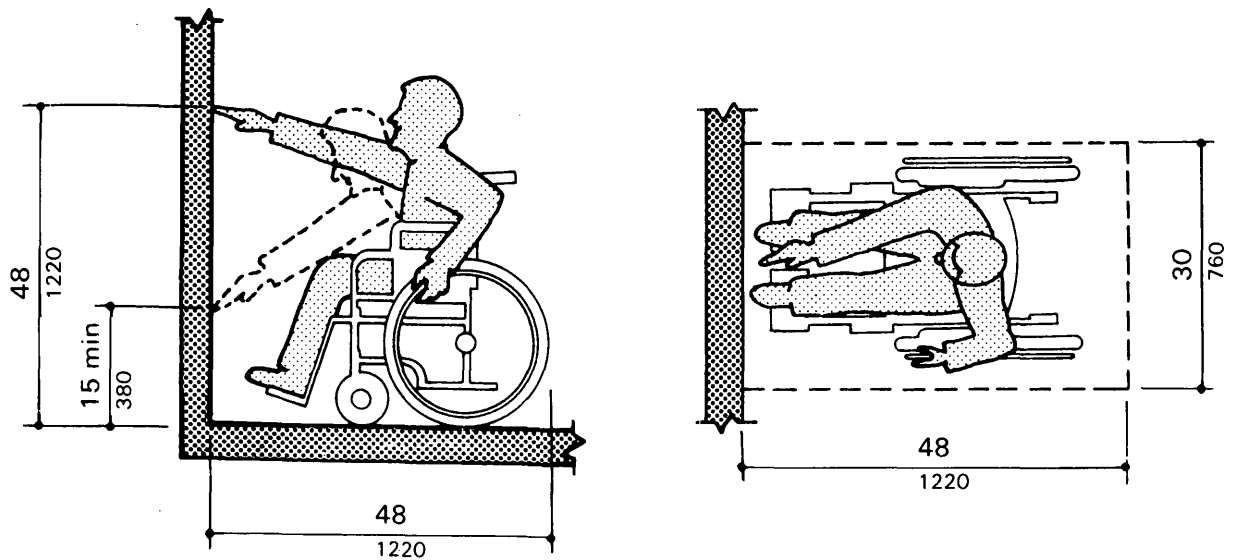
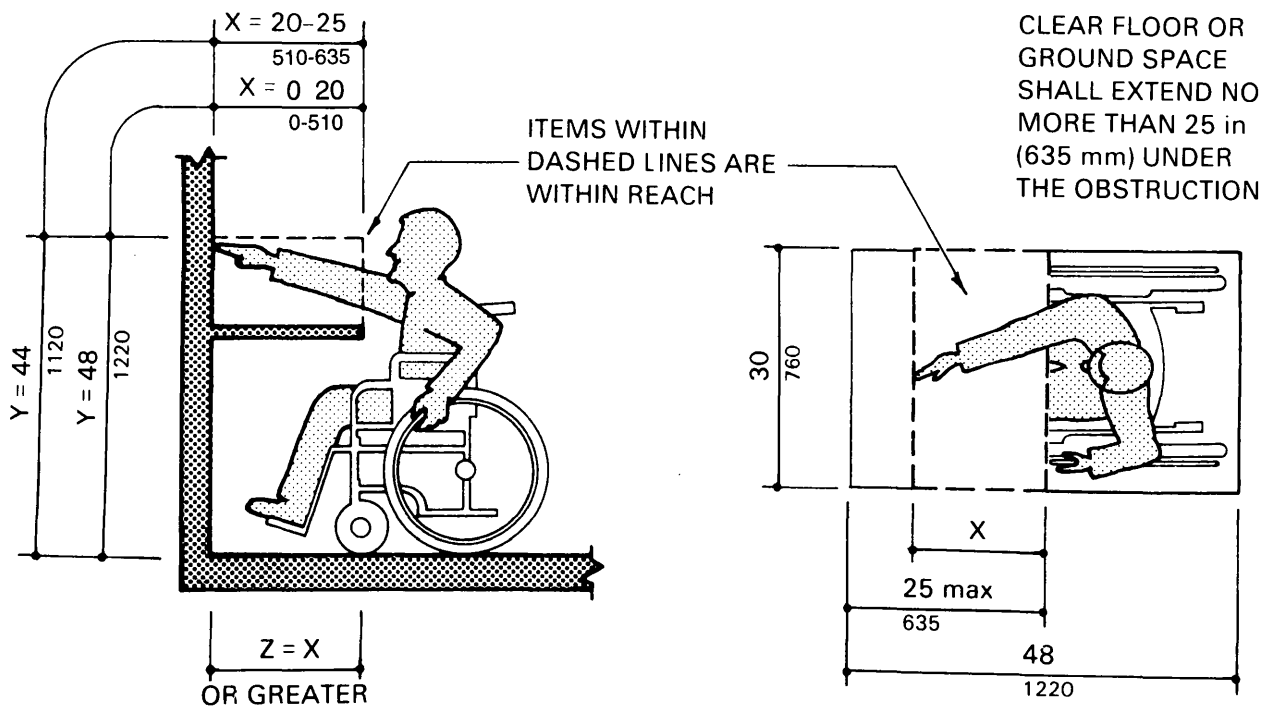


Fig. B4.2.5.1
Unobstructed Forward Reach Limit



NOTE: x = Reach depth, y = Reach height, z =
Clear knee space, z is the clear space below the obstruction,
which shall be at least as deep as the reach distance, x .

Fig. B4.2.5.2
Forward Reach Over an Obstruction

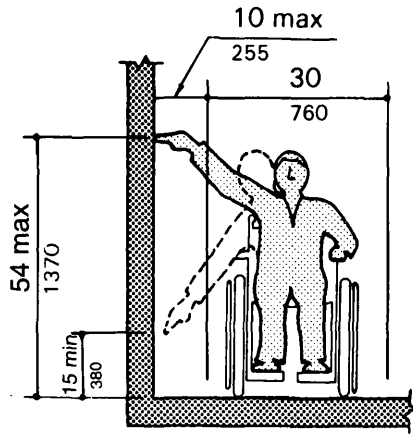


Fig. B4.2.6.1
Unobstructed Side Reach Limit

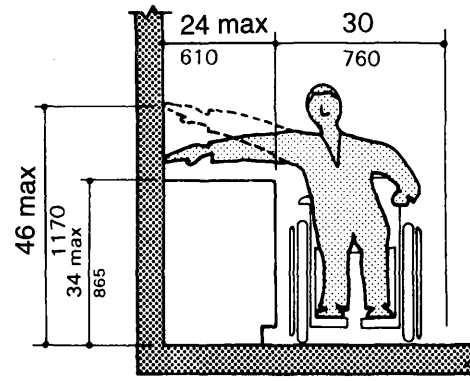
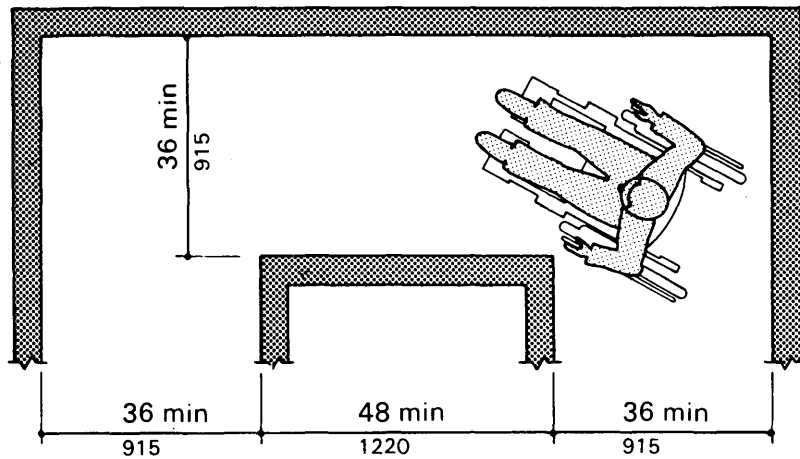
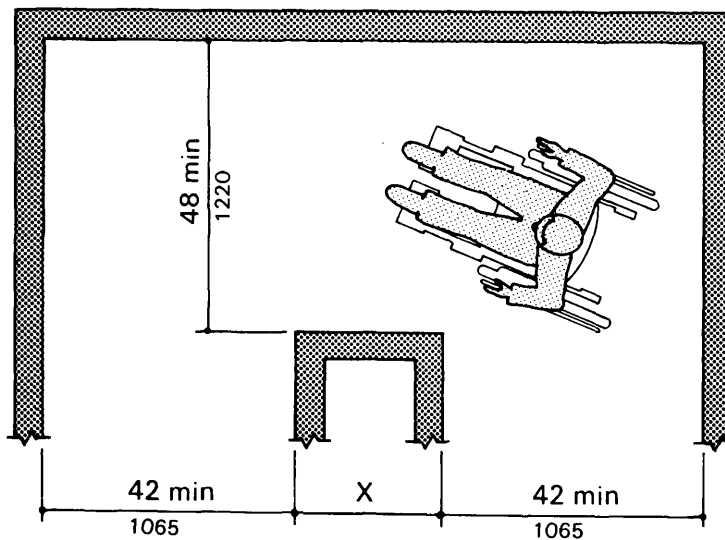


Fig. B4.2.6.2
Obstructed Side Reach Limit



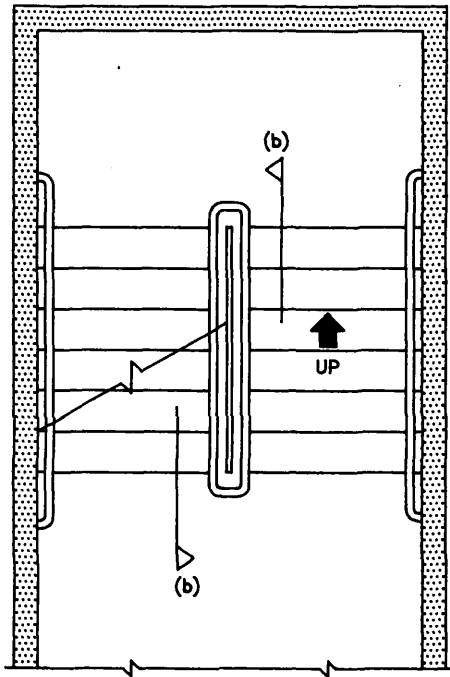
(a) Width of Accessible Route for 90° Turn



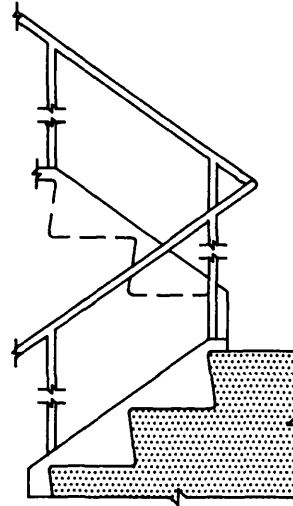
NOTE: Dimensions shown apply when $x < 48$ in (1220 mm).

**(b) Width of Accessible Route for Turns
around an Obstruction**

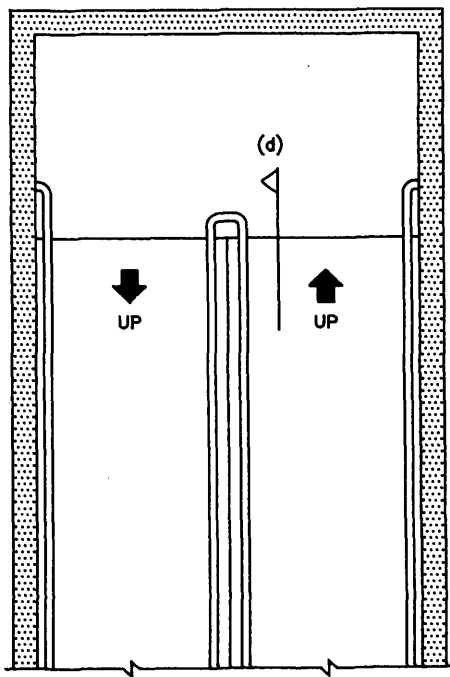
Fig. B4.3.3
Accessible Route Width for Turns



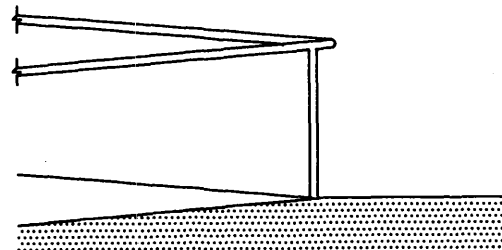
(a) Stair Plan



(b) Stair Elevation of Center Handrail



(c) Ramp Plan



(d) Ramp Elevation at Center Handrail

Fig. B4.3.10.3
Continuous Inside Handrails

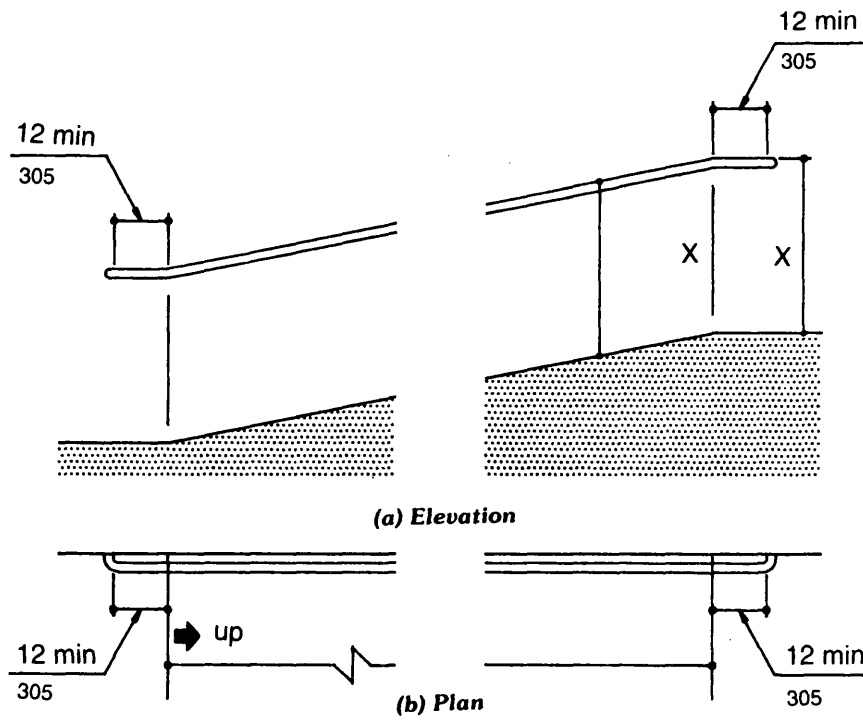


Fig. B4.3.11.1
Ramp Handrail Extensions

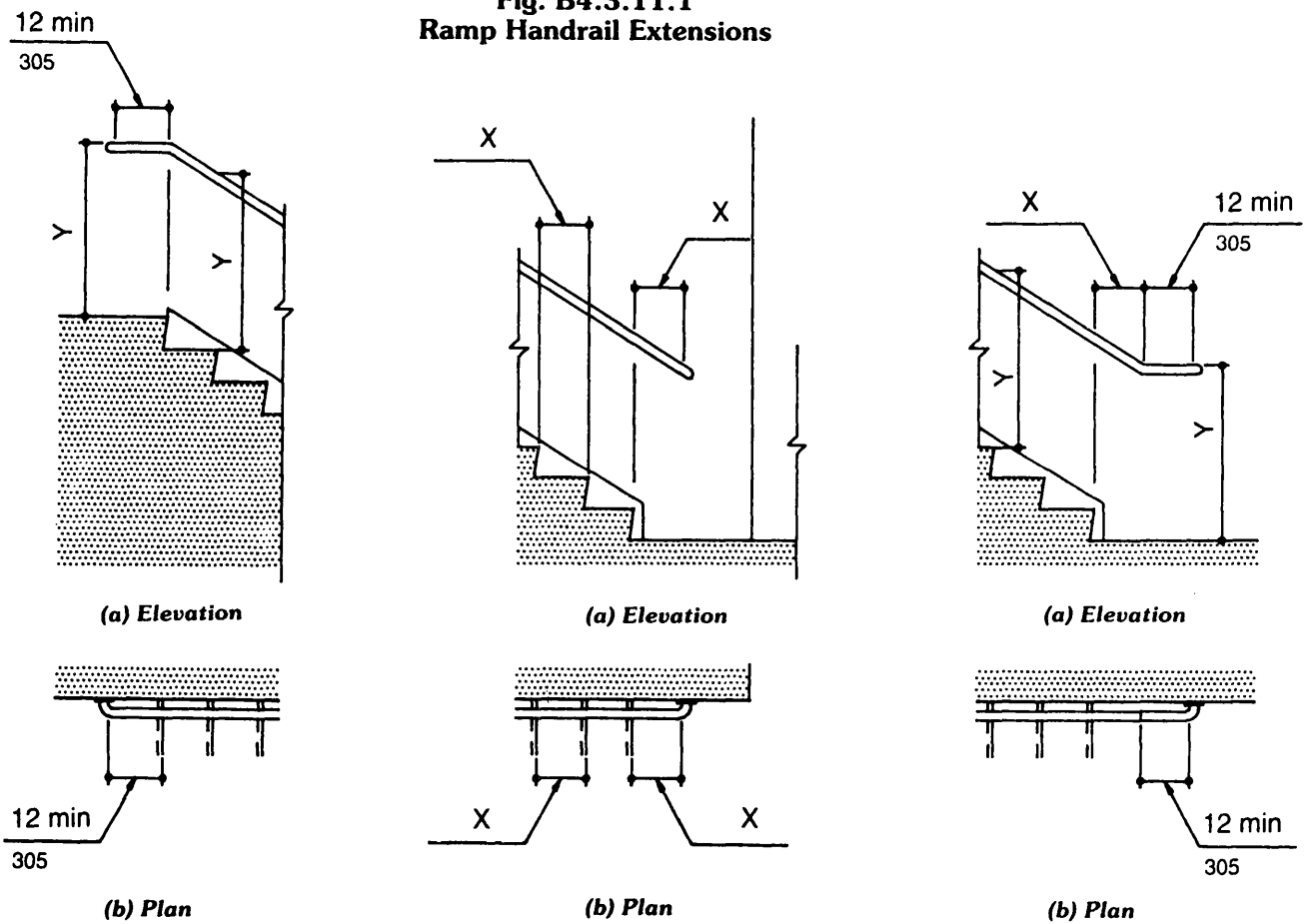


Fig. B4.3.11.2
Stair Handrail Extensions
Top

Fig. B4.3.11.3
Stair Handrail Extensions
Bottom

Fig. B4.3.11.4
Stair Handrail Extensions
Bottom

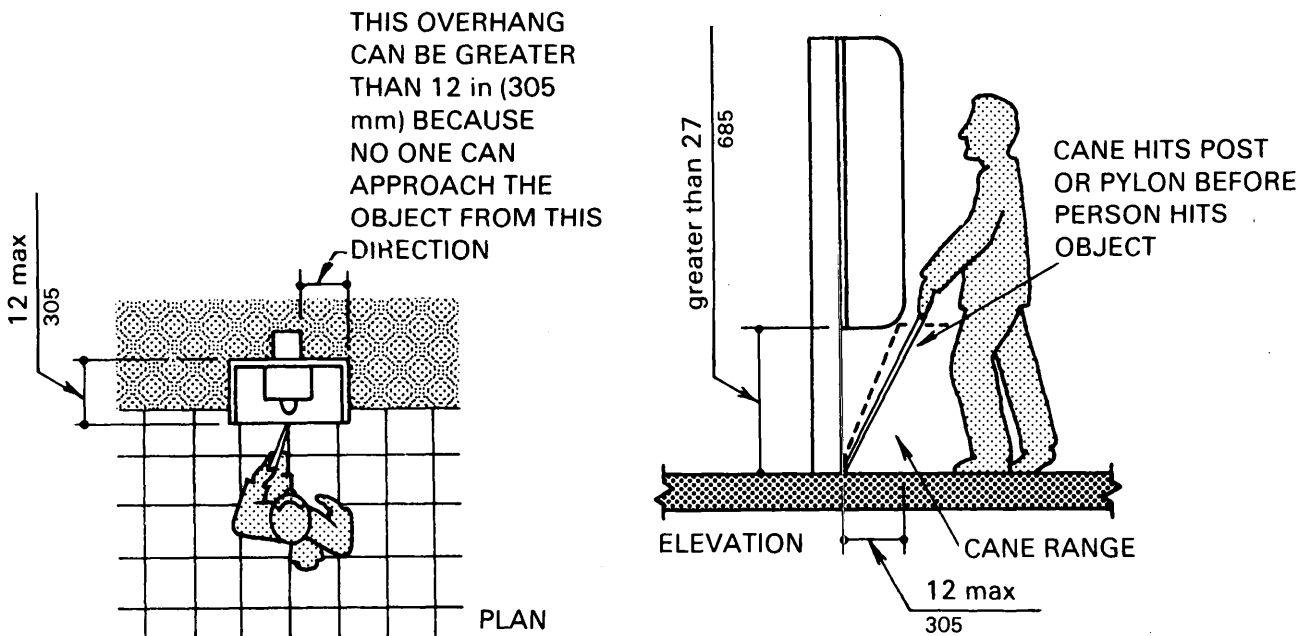
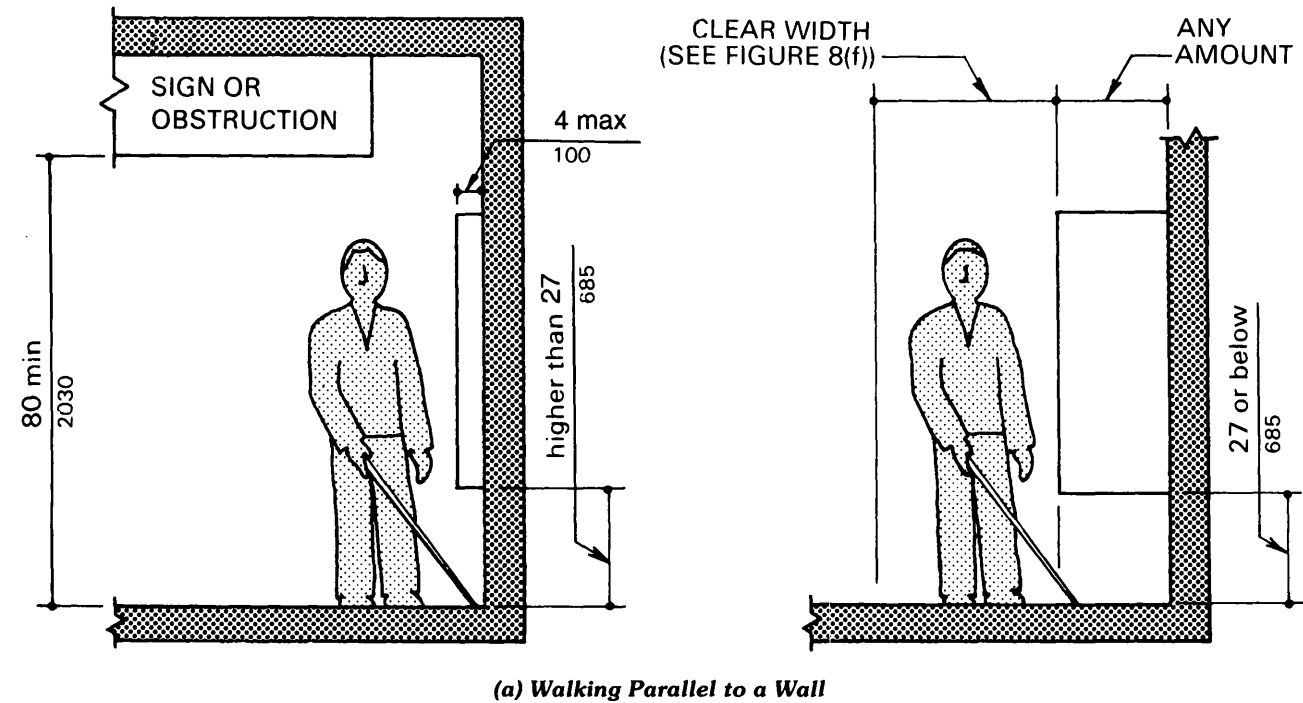
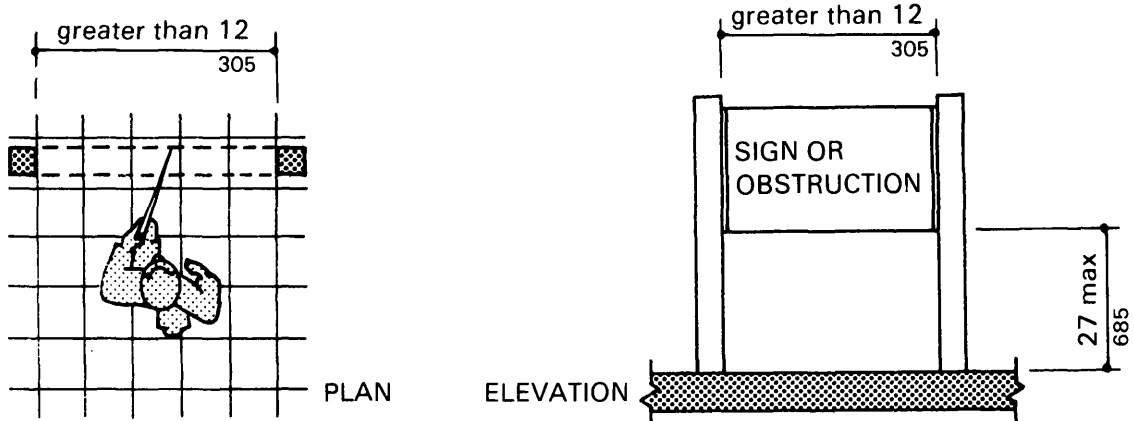
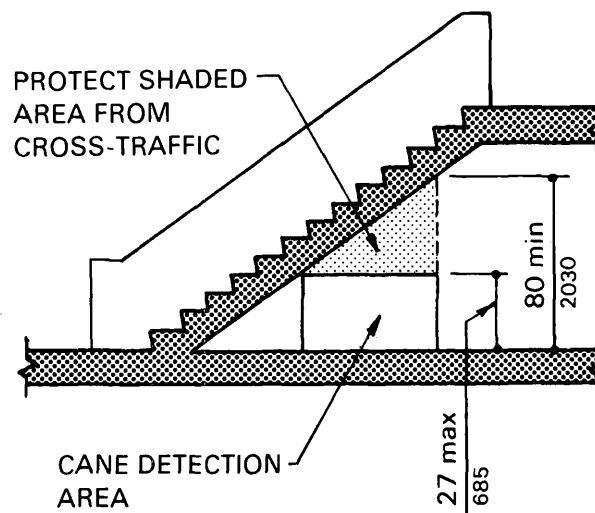


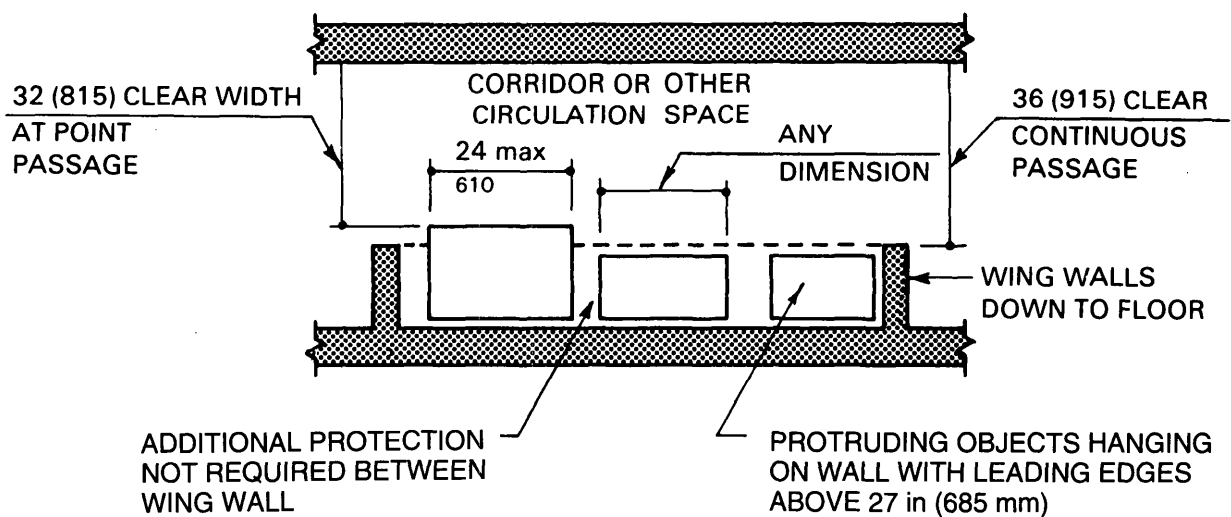
Fig. B4.4
Protruding Objects



(c) Free-Standing Objects

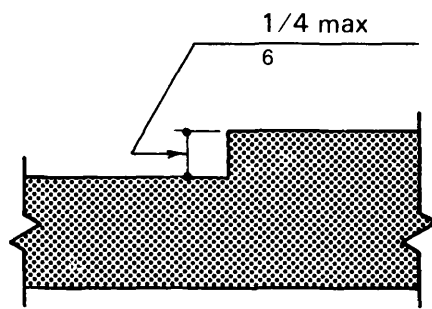


(d) Overhead Hazards

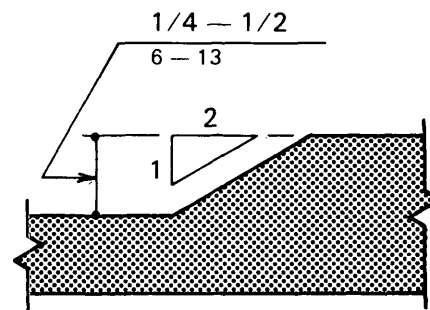


(e) Example of Protection around Wall-Mounted Objects and Measurements of Clear Widths

Fig. B4.4
Protruding Objects (continued)



(a) Vertical Changes in Level



(b) Beveled Changes in Level

Fig. B4.5
Changes in Level

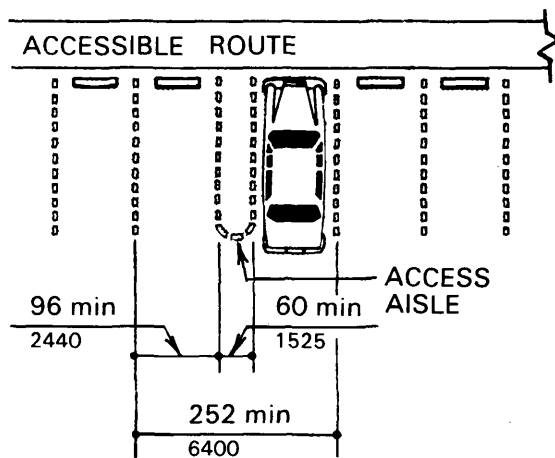


Fig. B4.6.2
Dimensions of Parking Spaces

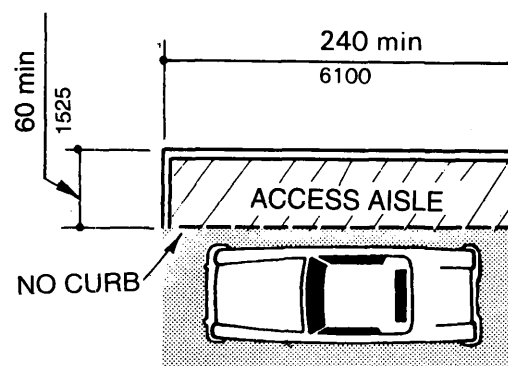
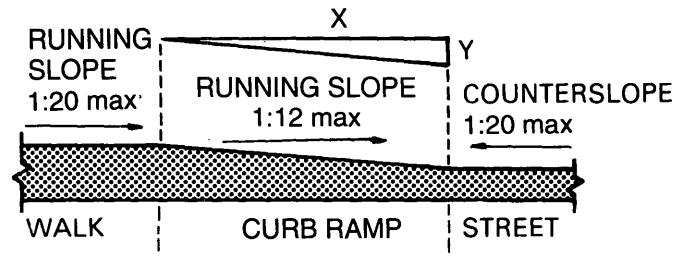


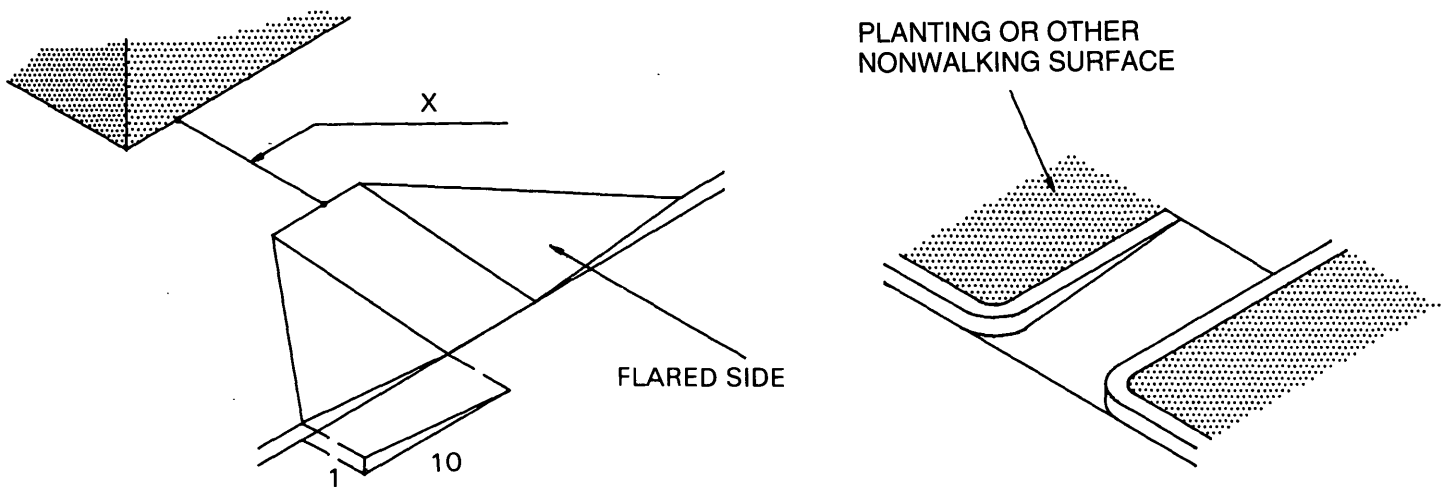
Fig. B4.6.3
Access Aisle at Passenger Loading Zones



NOTE:

- (1) Slope = y/x , where x is a level plane.
 (2) Counterslope shall not exceed 1:20.

Fig. B4.7.2
Measurement of Curb Ramp Slopes



NOTE: If $x < 48$ in (1220 mm), then the slope of the flared sides shall not exceed 1:12.

(a) Flared Sides

(b) Returned Curb

Fig. B4.7.5
Sides of Curb Ramps

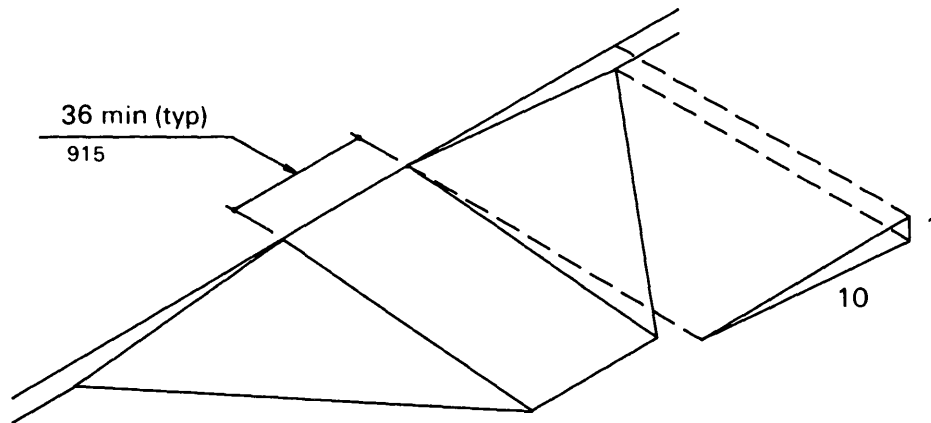


Fig. B4.7.6
Built-up Curb Ramp

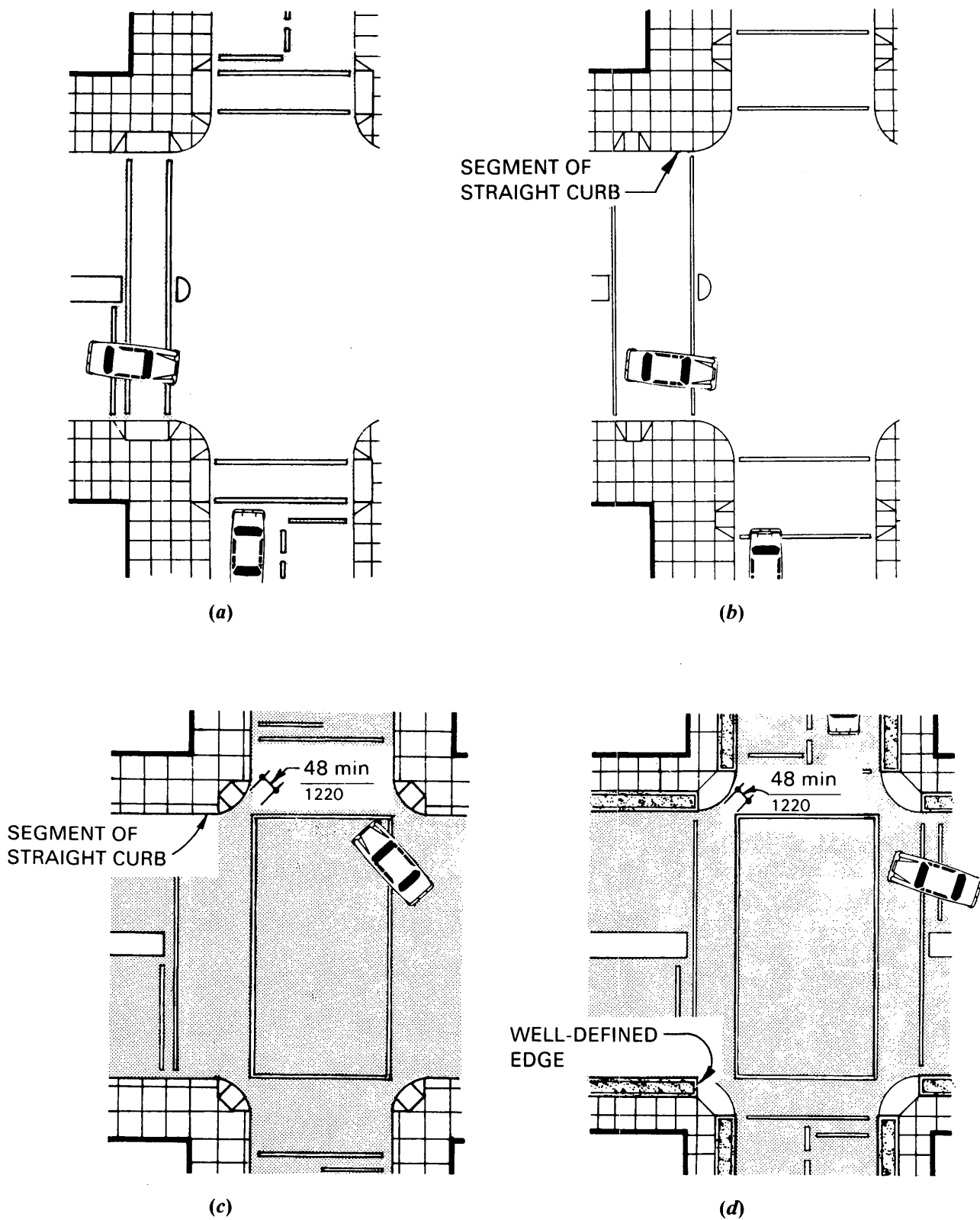
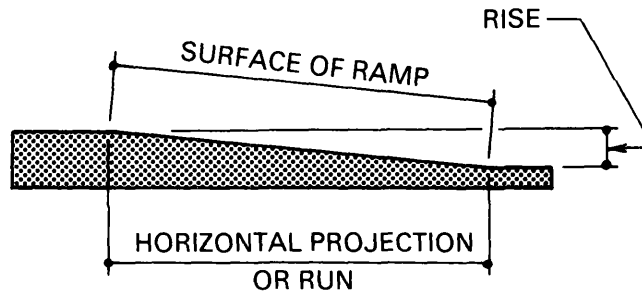


Fig. B4.7.9
Curb Ramps at Marked Crossings



Slope	Maximum Rise		Maximum Horizontal Projection	
	in	mm	ft	m
1:12 to 1:15	30	760	30	9
1:16 to 1:19	30	760	40	12
1:20	30	760	50	15

Fig. B4.8.2
Components of a Single Ramp Run and Sample Ramp Dimensions

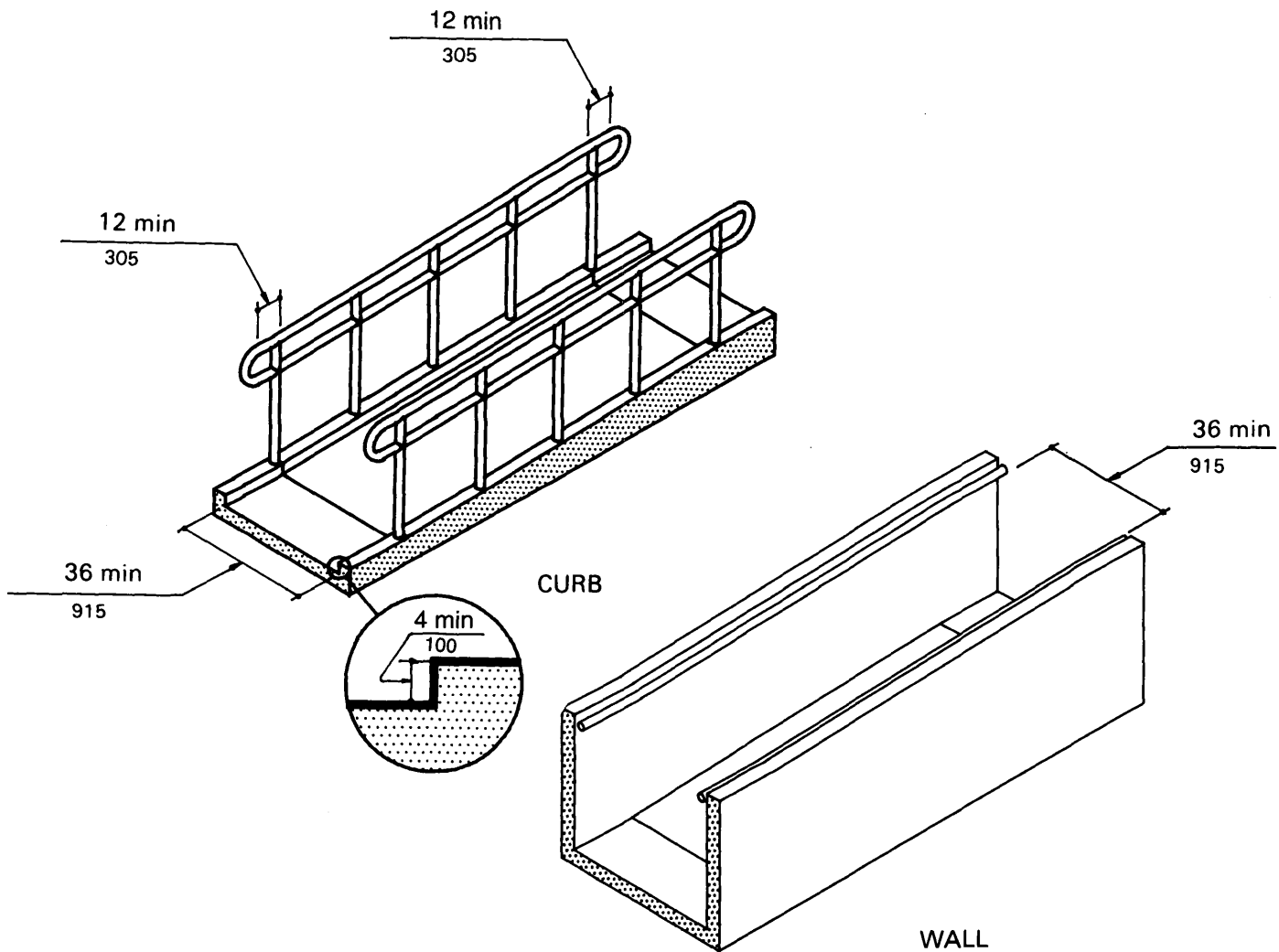


Fig. B4.8.3
Example of Clear Width and Edge Protection

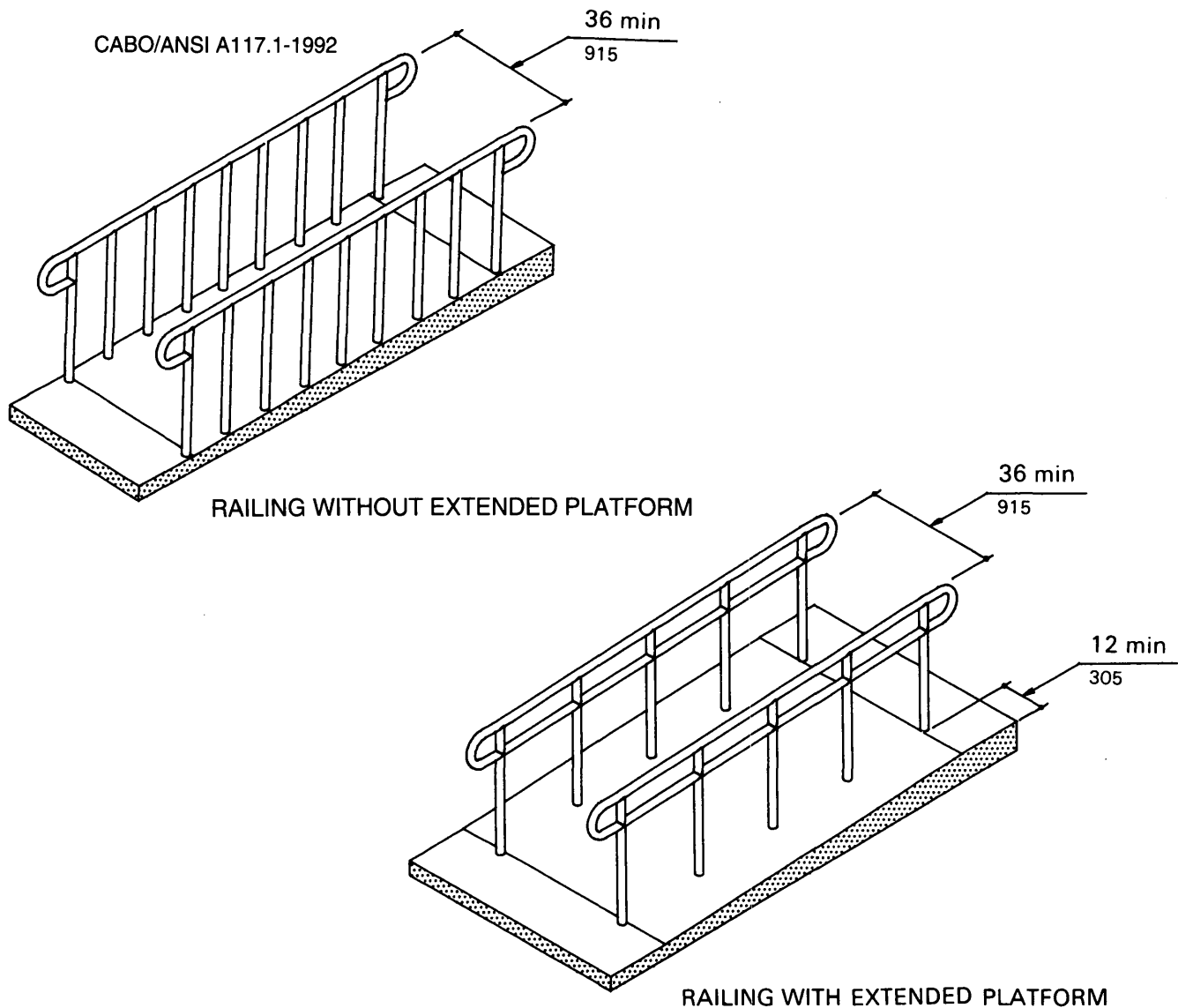


Fig. B4.8.3
Example of Clear Width and Edge Protection (continued)

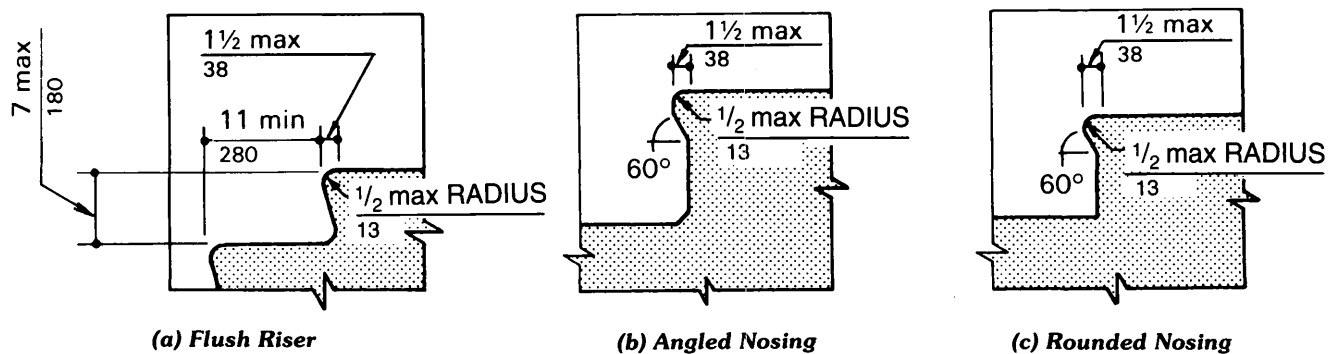
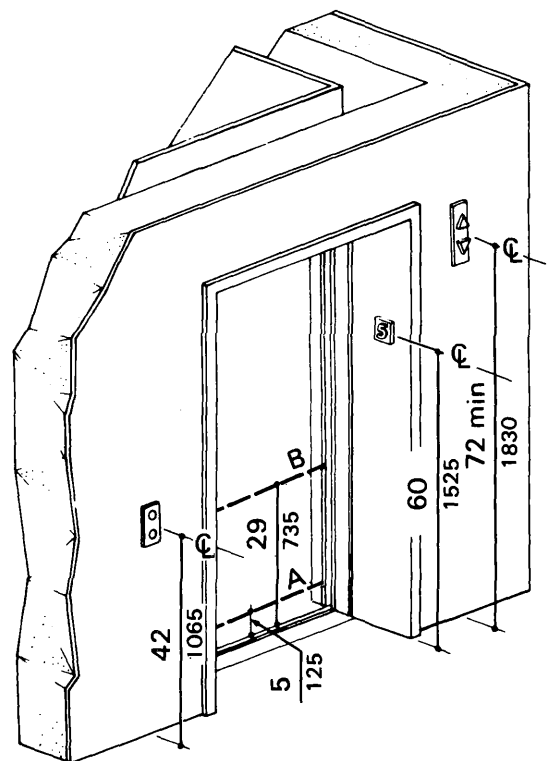
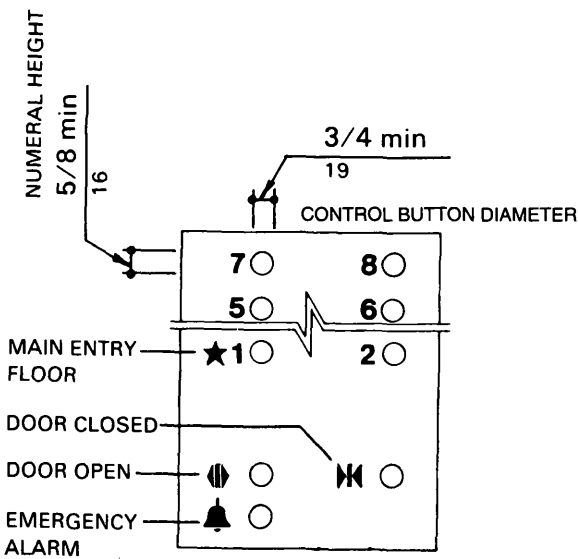


Fig. B4.9.2.1
Usable Tread Width and Examples of Acceptable Protruding Nosings

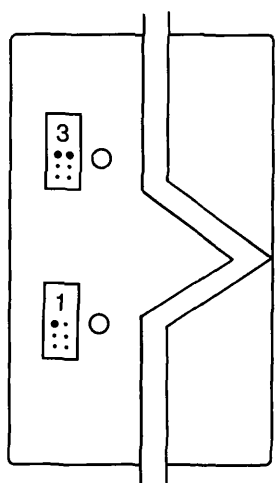


NOTE: The automatic door reopening device is activated if an object passes through either line A or line B. Line A and line B represent the vertical locations of the door reopening device not requiring contact.

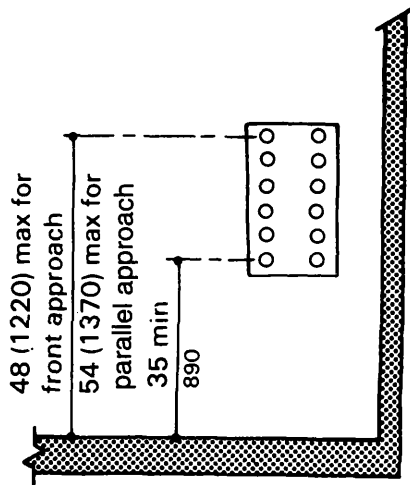
Fig. B4.10.1
Hoistway and Elevator Entrances



(a) Panel Detail



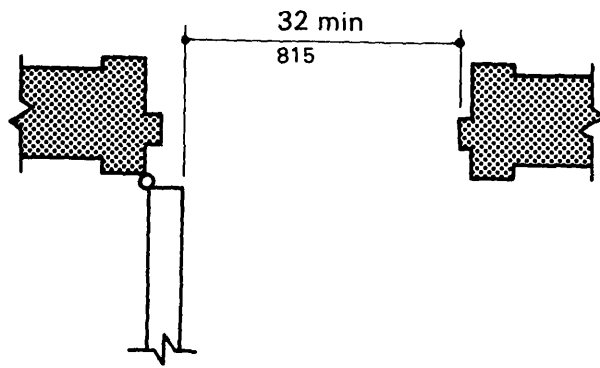
(b) Braille Detail



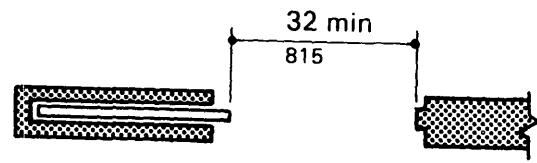
(c) Car Control Height

Fig. B4.10.1.12
Car Controls

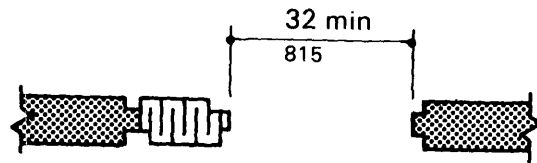
CABO/ANSI A117.1-1992



(a) Detail



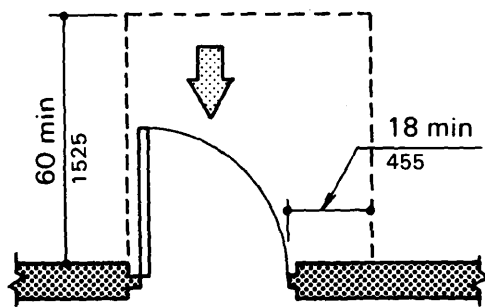
(b) Sliding Door



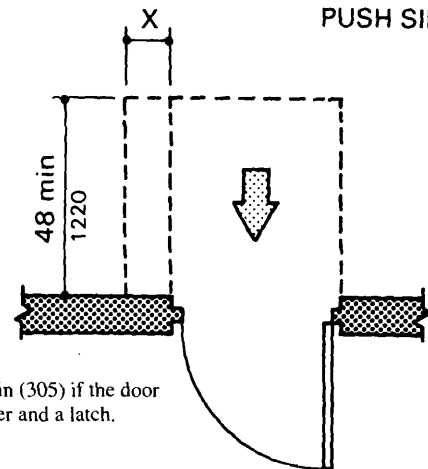
(c) Folding Door

Fig. B4.13.5
Clear Doorway Width and Depth

PULL SIDE



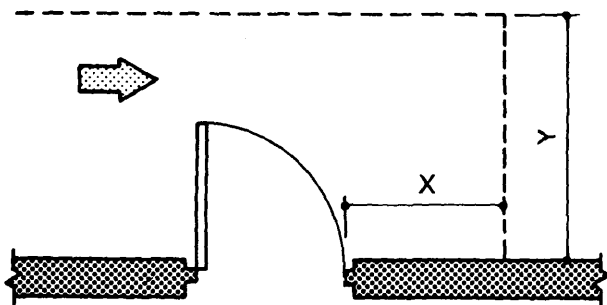
PUSH SIDE



NOTE: $x = 12$ in (305) if the door has both a closer and a latch.

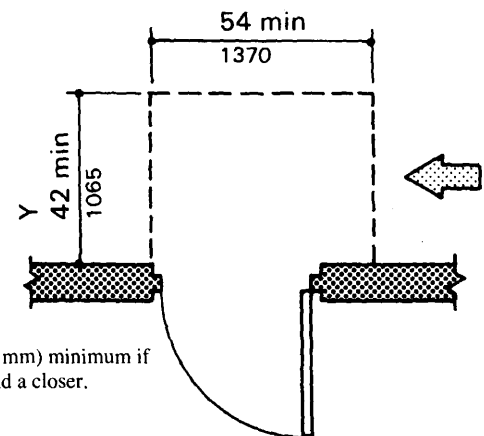
(a) Front Approaches — Swinging Door

PULL SIDE



NOTE: $x = 36$ in (915 mm) minimum if $y = 60$ in (1525 mm); $x = 42$ in (1065 mm) minimum if $y = 54$ in (1370 mm).

PUSH SIDE



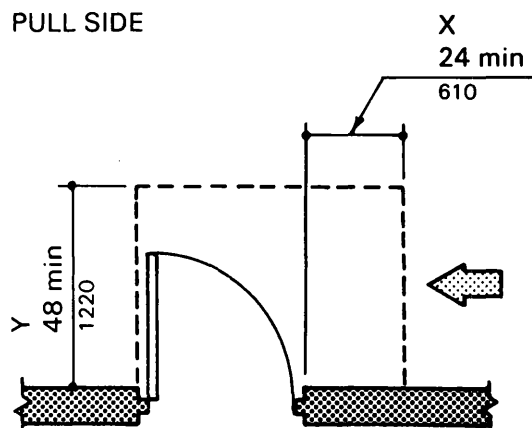
NOTE: $y = 48$ in (1220 mm) minimum if door has both a latch and a closer.

(b) Hinge-side Approaches — Swinging Door

NOTE: All doors in alcoves shall comply with the clearances for front approaches.

Fig. B4.13.6
Maneuvering Clearances at Doors

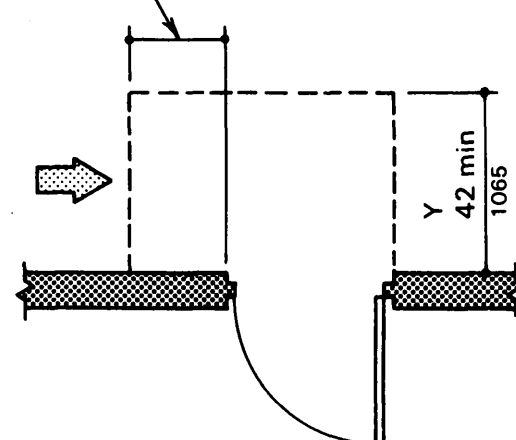
PULL SIDE



NOTE: $y = 54$ in (1370 mm) minimum if the door has a closer.

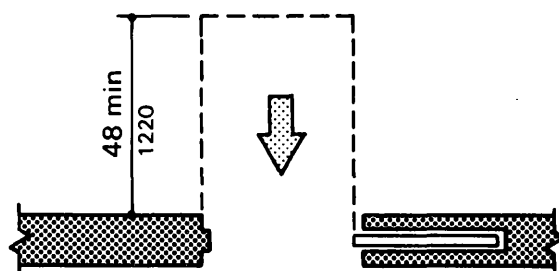
X
24 min
610

PUSH SIDE

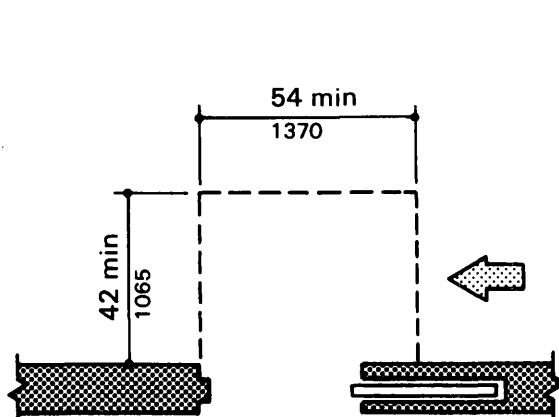


NOTE: $y = 48$ in (1220 mm) minimum if the door has a closer.

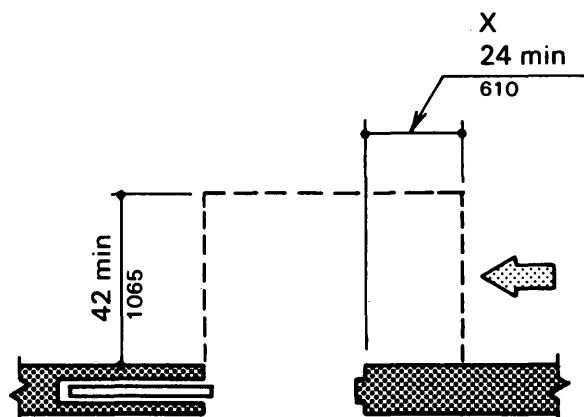
(c) Latch-side Approaches — Swinging Door



(d) Front Approaches — Sliding Door and Folding Doors



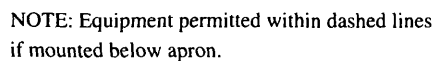
(e) Sliding-Side Approach — Sliding Door and Folding Doors



(f) Latch-Side Approach — Sliding Door and Folding Doors

NOTE: All doors in alcoves shall comply with the clearances for front approaches.

Fig. B4.13.6
Maneuvering Clearances at Doors (continued)



(a) Spout Height and Leg Clearance



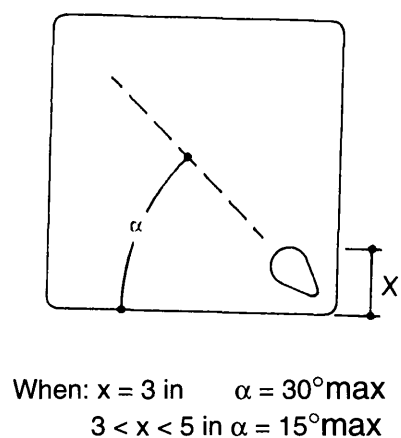


Fig. B4.15.2.3
Horizontal Angle of Water Stream-Plan View

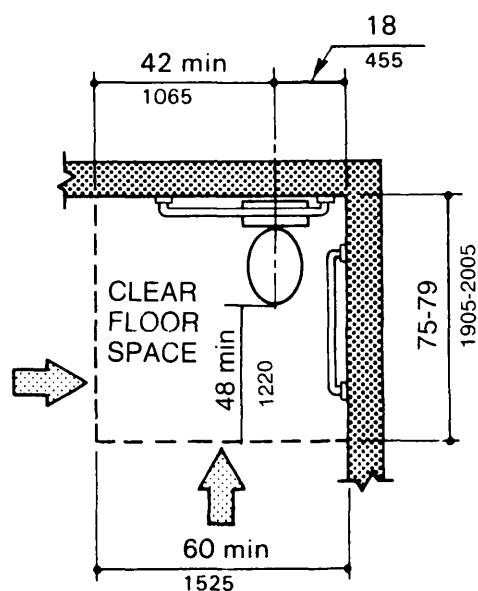


Fig. B4.17.2
Clear Floor Space at Water Closets

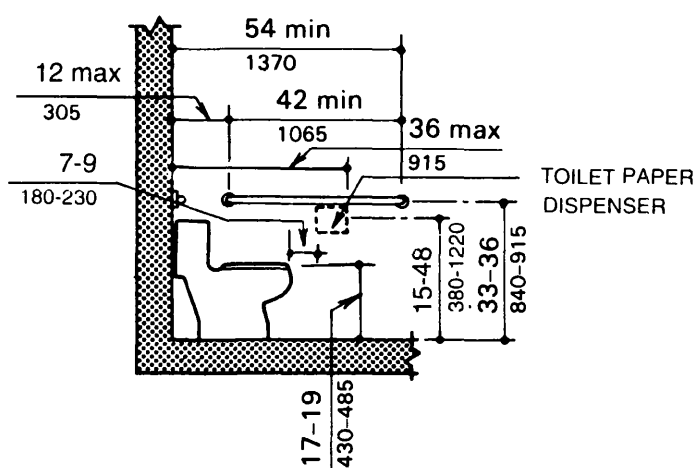


Fig. B4.17.3
Water Closet
Side View

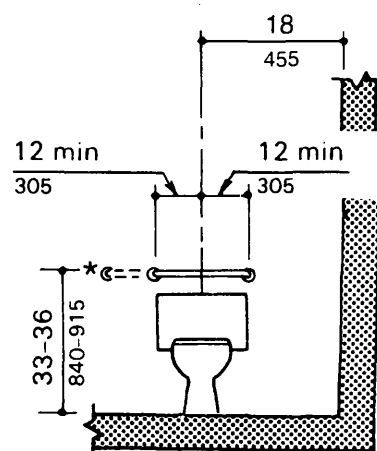
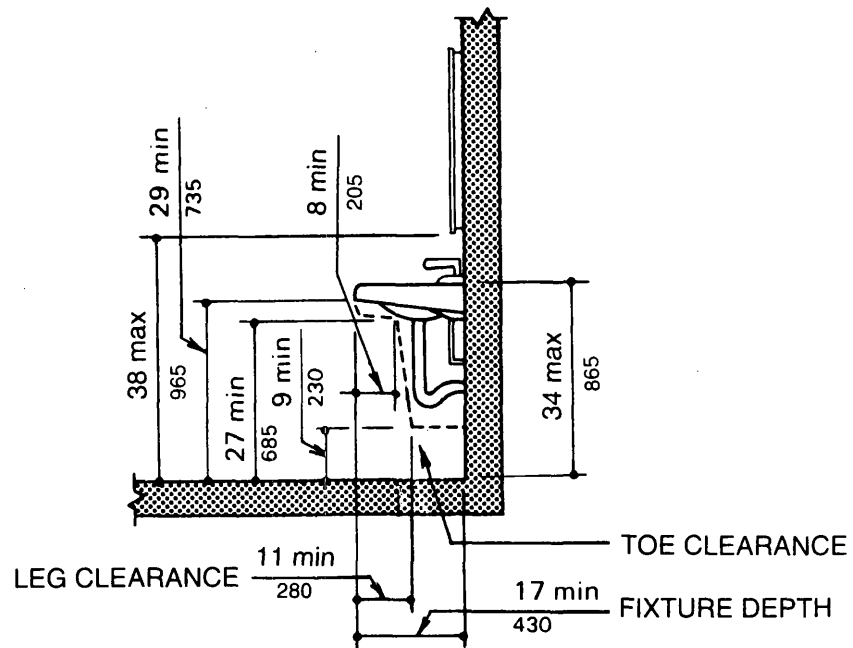
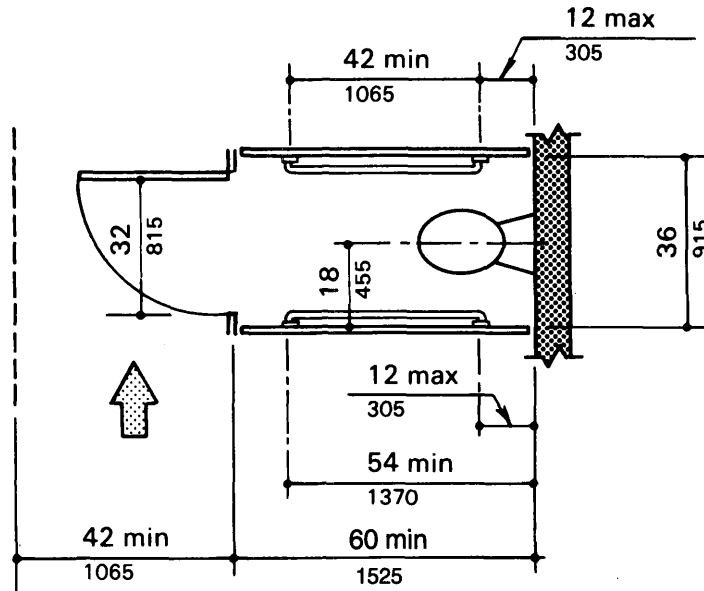


Fig. B4.17.4
Water Closet
Front View

* Where space permits, extend grab bar on transfer side.



NOTE: Dashed line indicates dimensional clearance of optional under fixture enclosure.

Fig.B4.20.3.1
Leg Clearances

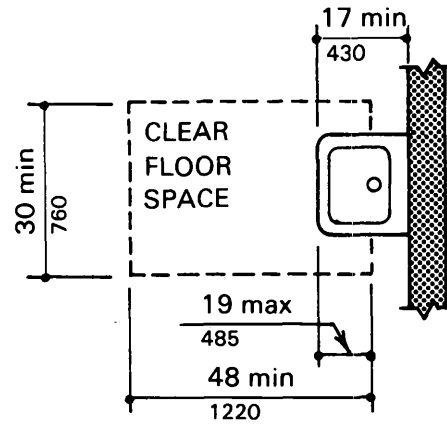
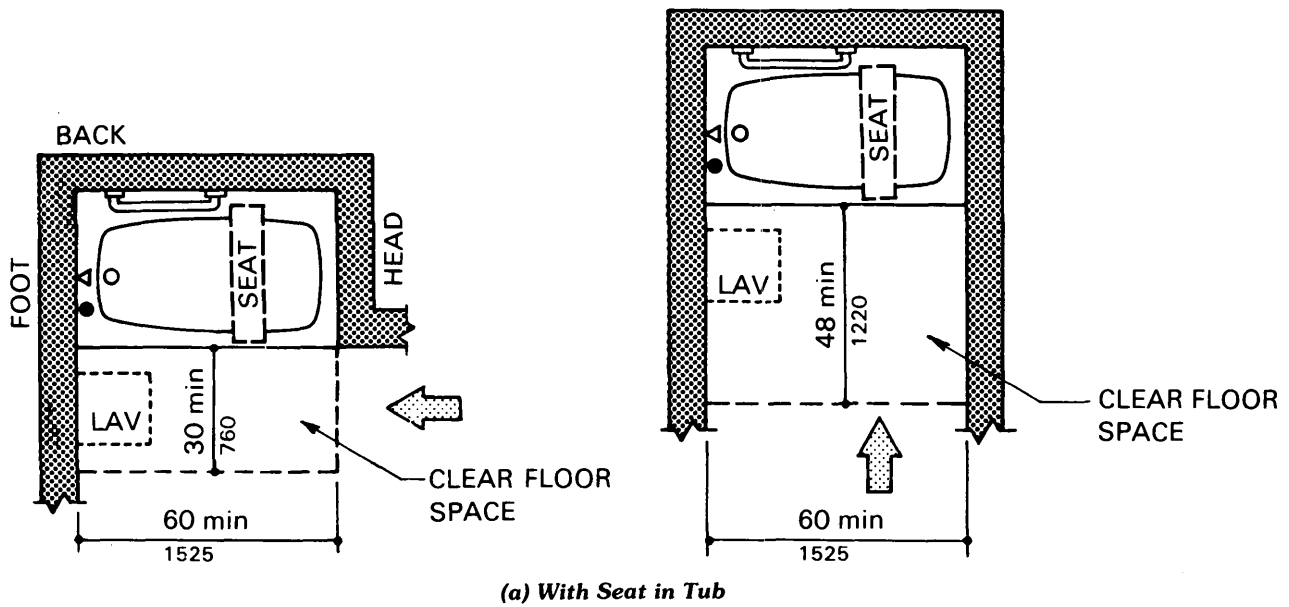


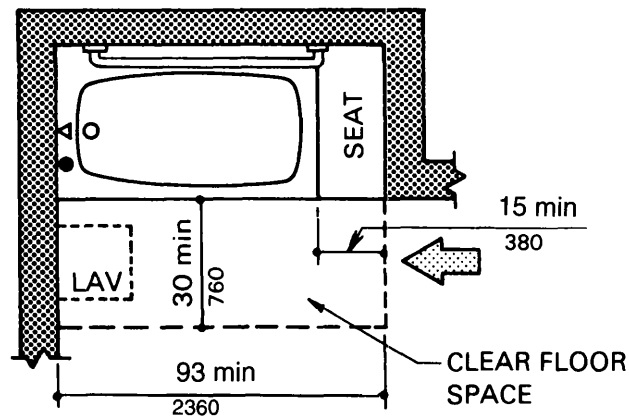
Fig. B4.20.3.2
Clear Floor Space at Lavatories and Sinks



(a) With Seat in Tub

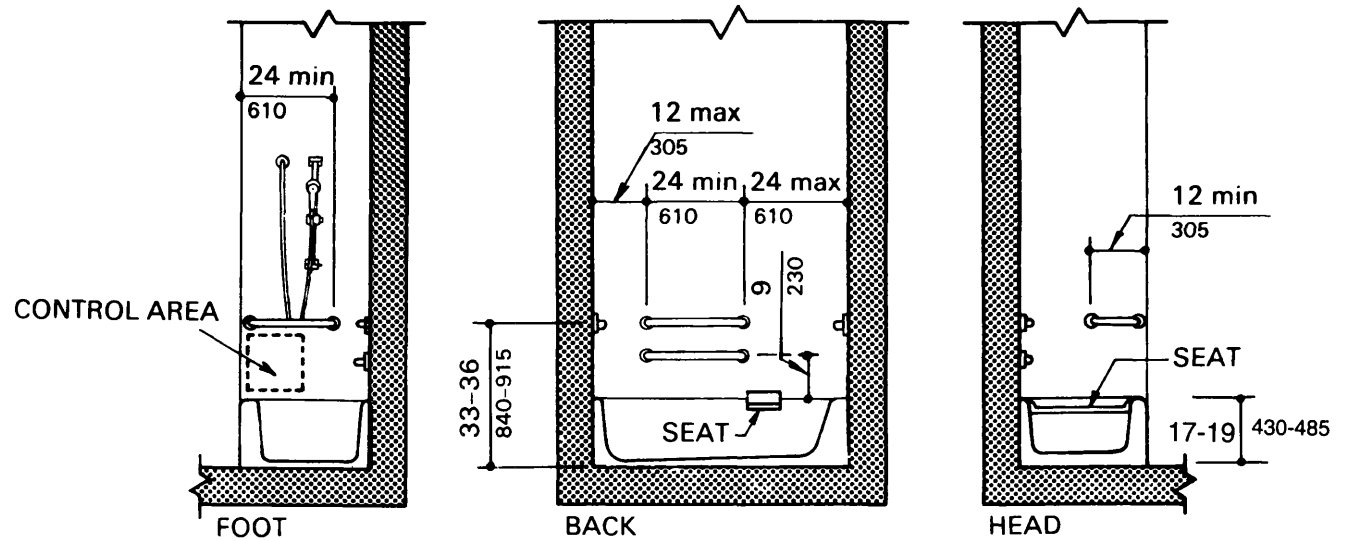
SYMBOL KEY:

- = Shower controls
- ◄ = Shower head
- = Drain

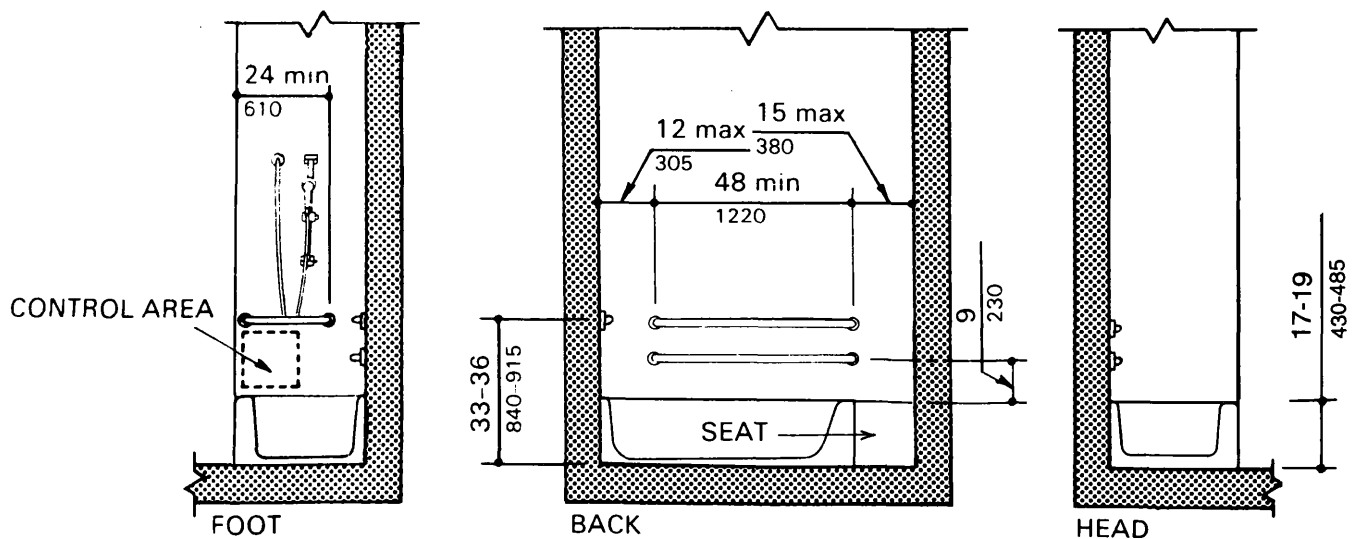


(b) With Seat at Head of Tub

Fig.B4.21.2
Clear Floor Space at Bathtubs



(a) Without Permanent Seat in Tub



(b) With Permanent Seat at Head of Tub

Fig.B4.21.4
Bathtub Accessories

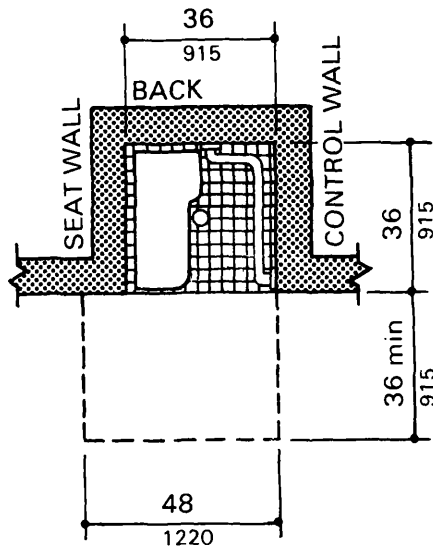


Fig. B4.22.2.1
Transfer Type Shower Stall

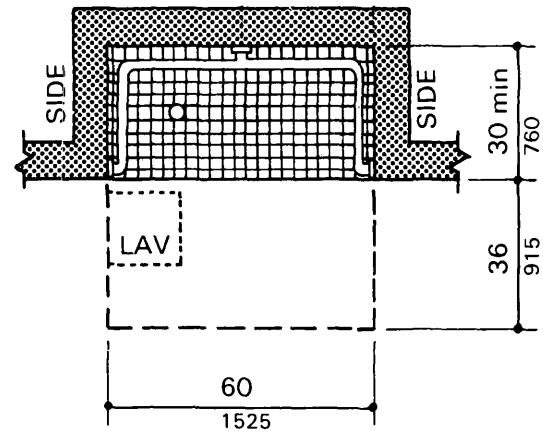


Fig. B4.22.2.2
Roll-in Type Shower Stall

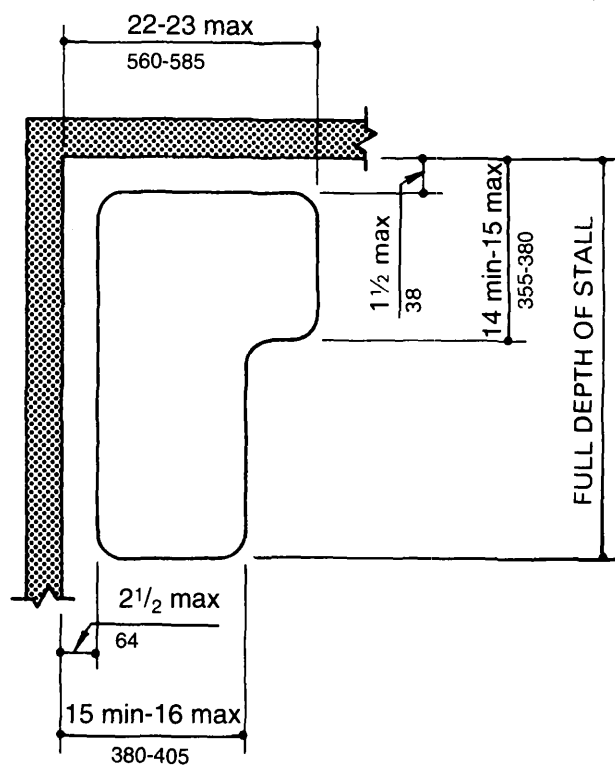
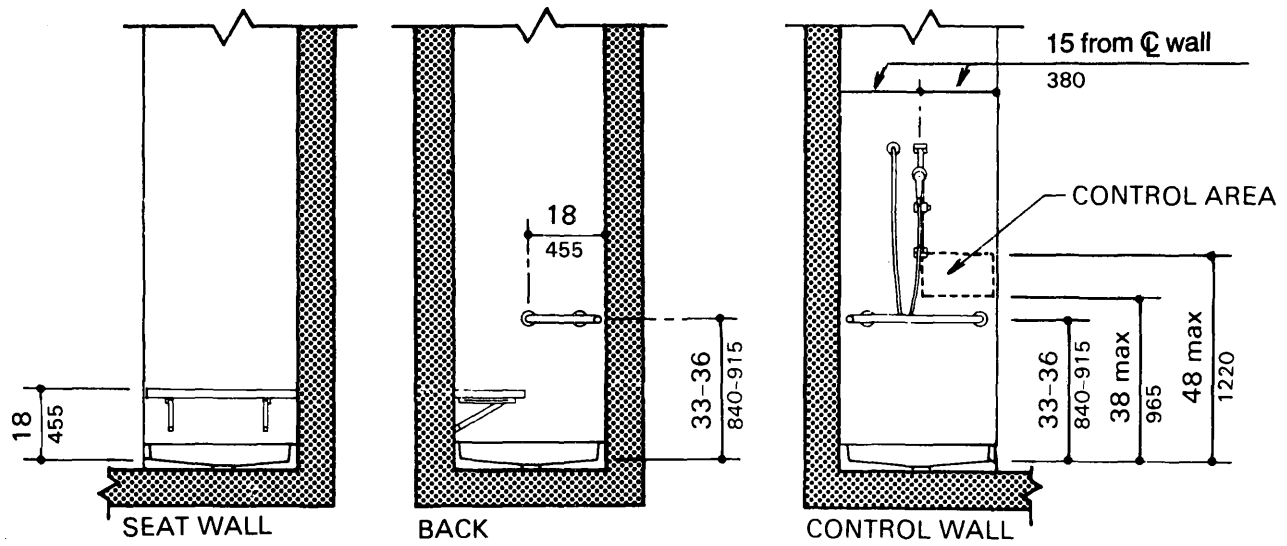
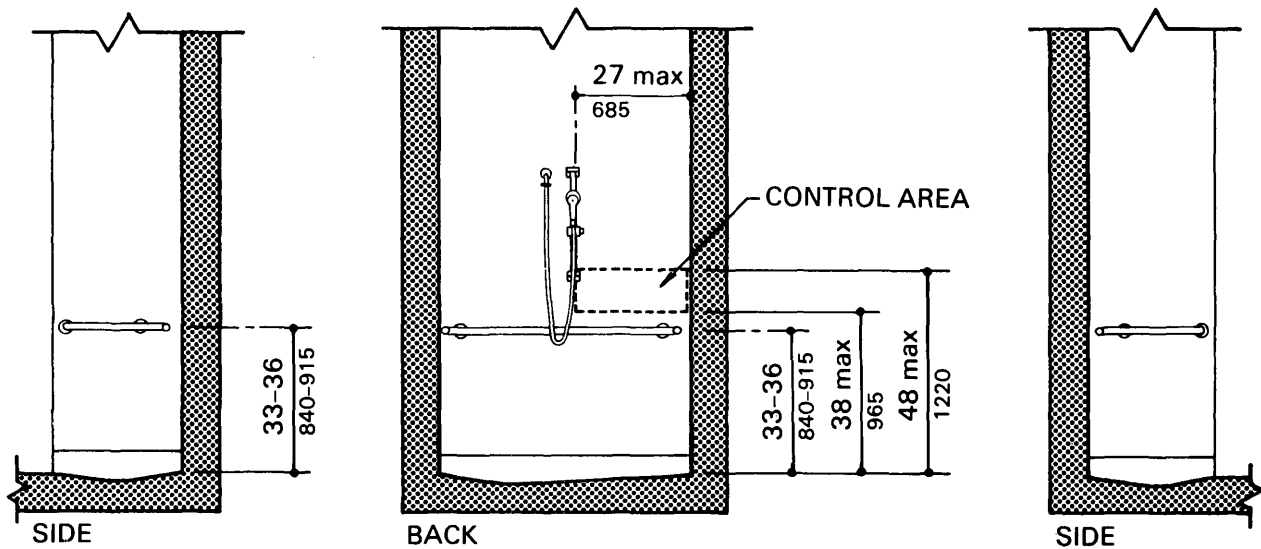


Fig. B4.22.3
Shower Seat Design



(a) 36-in by 36-in (915-mm by 915-mm) Stall



NOTE: Shower head and control area may be on back wall (as shown) or on either side wall.

(b) 30-in by 60-in (760-mm by 1525-mm) Stall

Fig. B4.22.4
Grab Bars at Shower Stalls

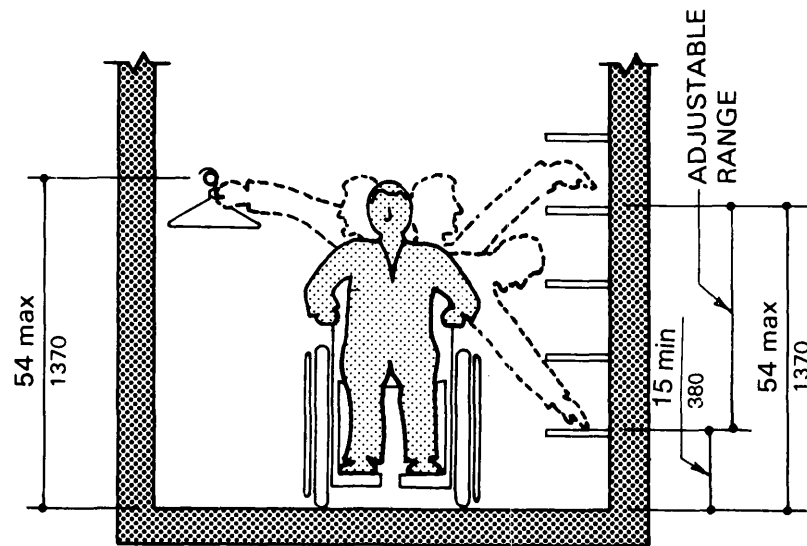


Fig. B4.23
Storage Shelves and Closets

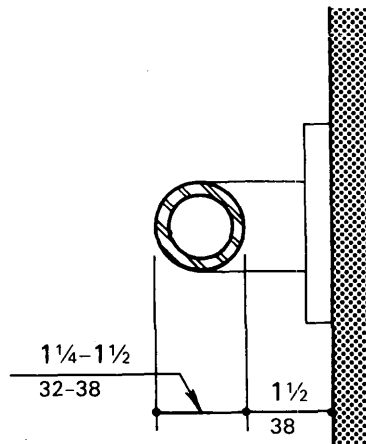


Fig. B4.24.2.1
Size and Spacing of Grab Bars

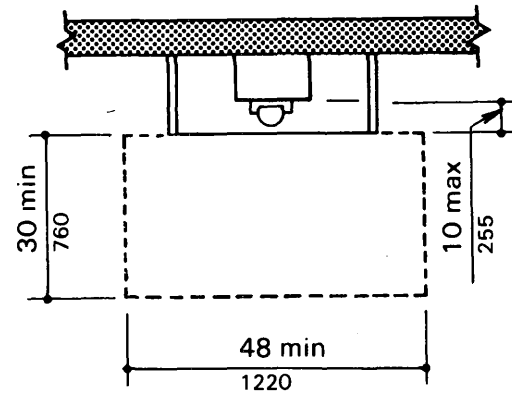


Fig. B4.29.2.1
Parallel Approach to Telephone

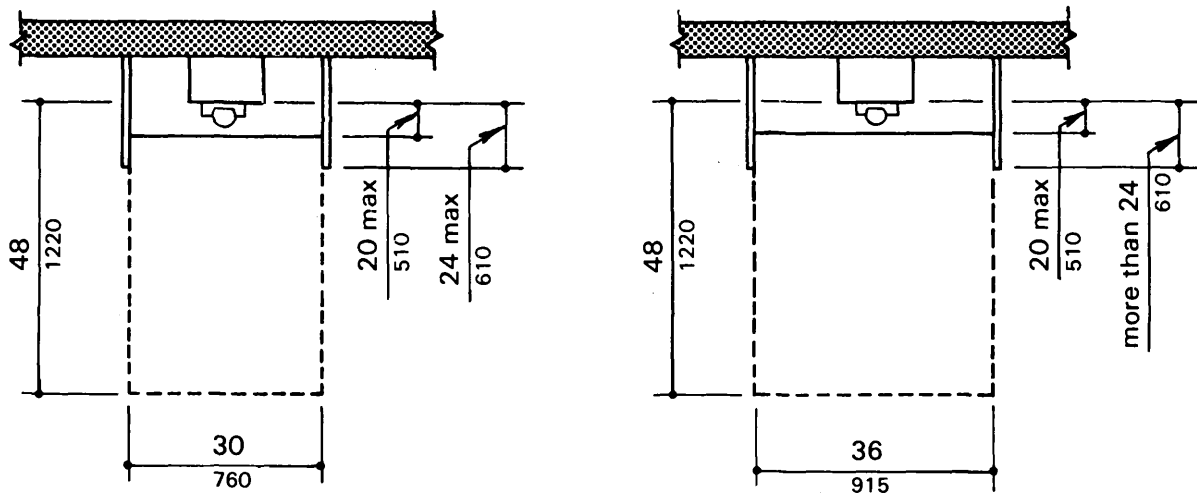


Fig. B4.29.2.2
Forward Approach to Telephones

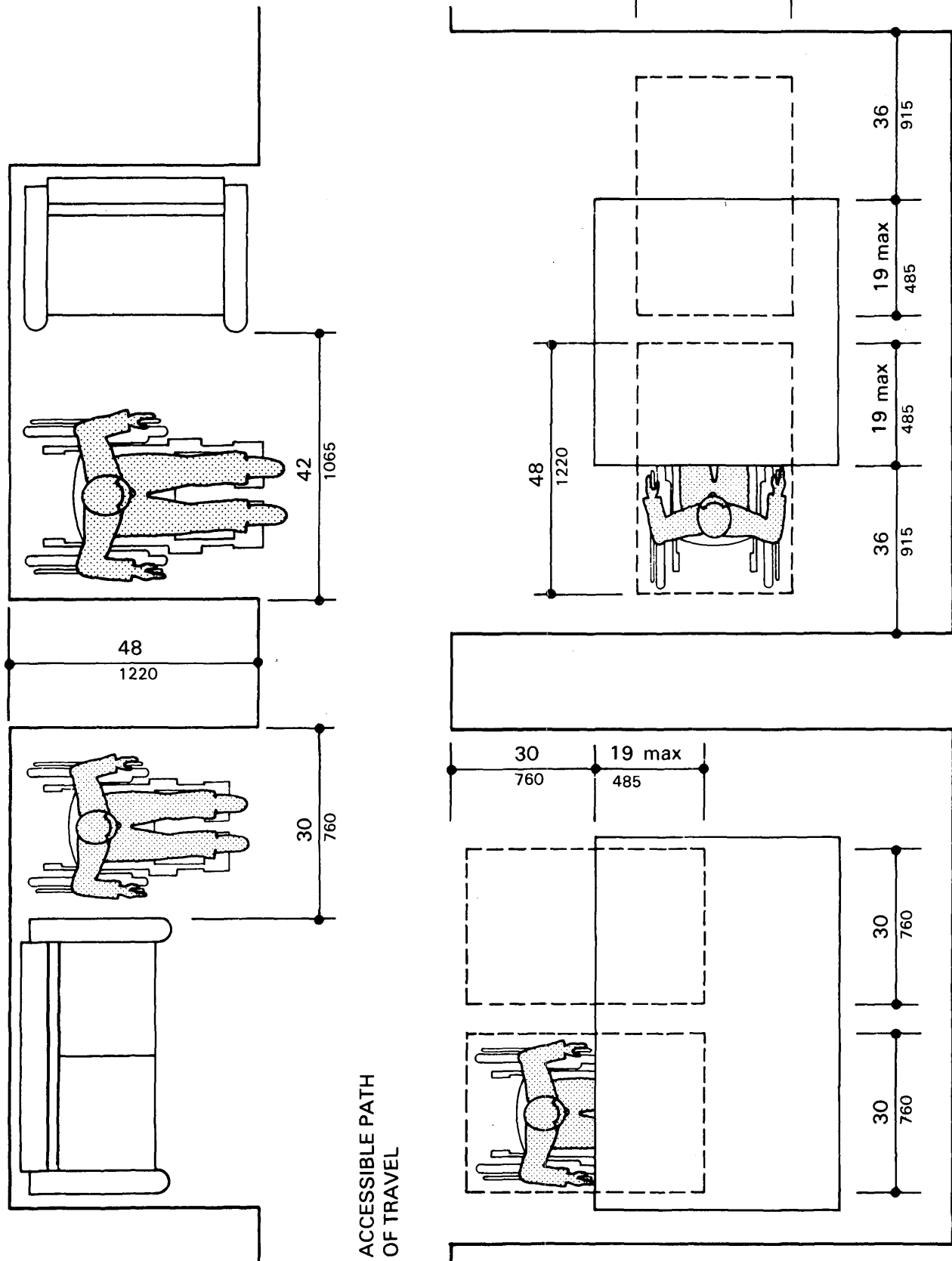


Fig. B4.31.2
Minimum Clearances for Seating and Tables

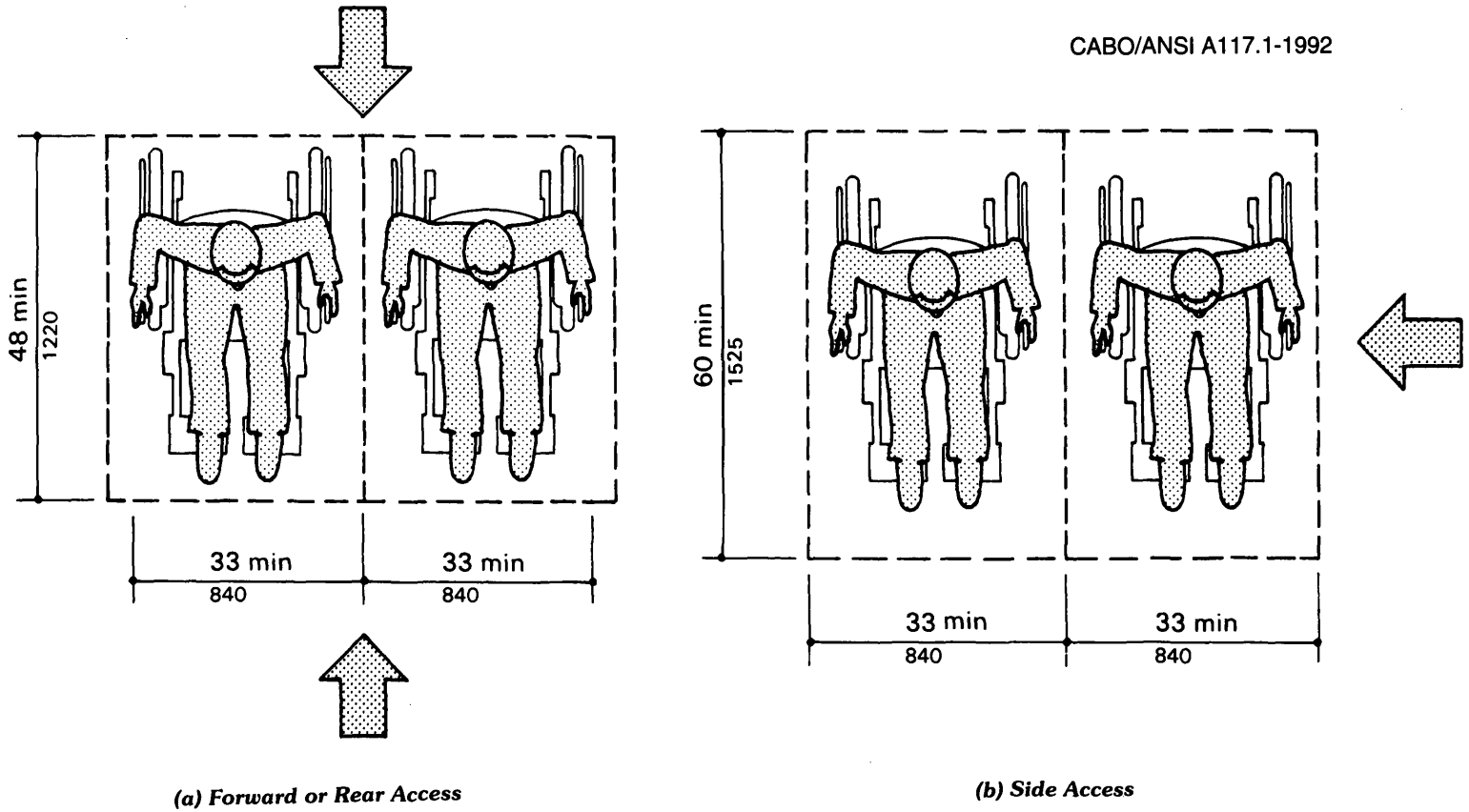


Fig. B4.32.2
Space Requirements for Wheelchair Seating Spaces in a Series

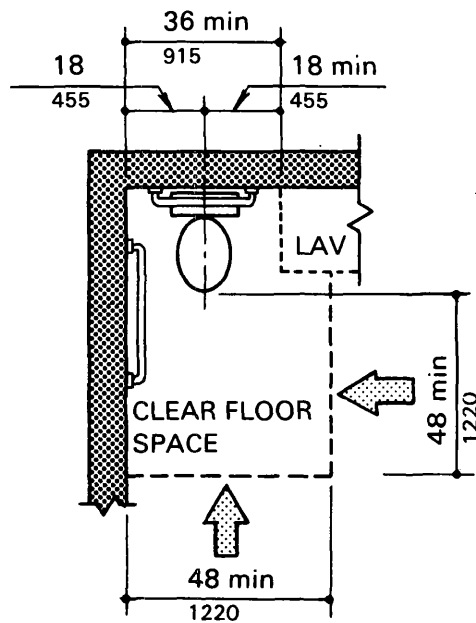
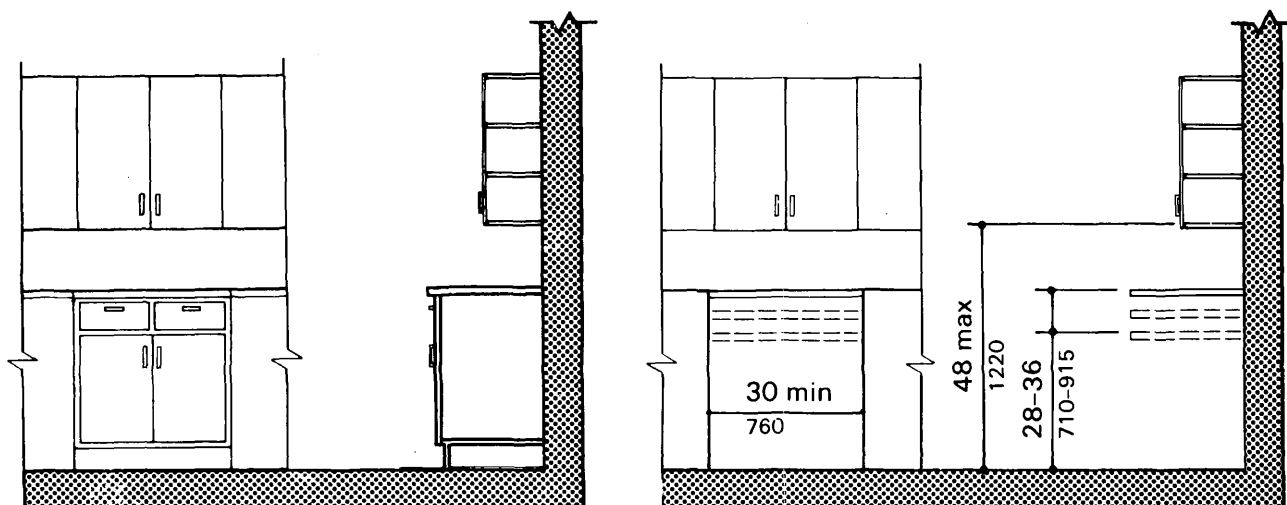
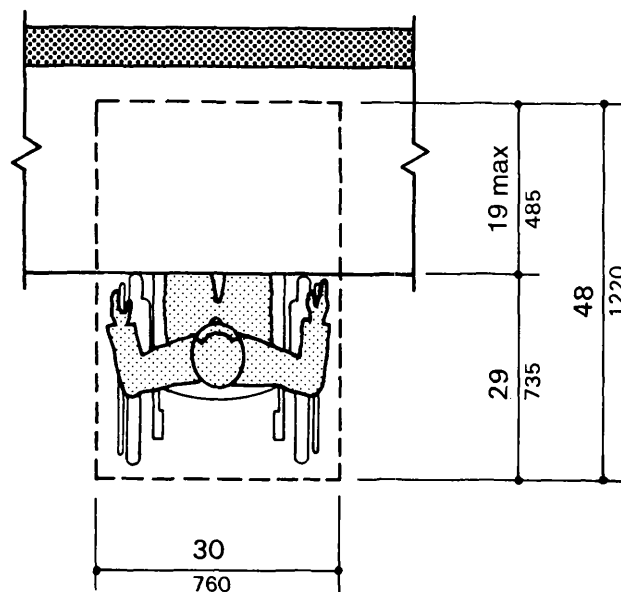


Fig. B4.33.3.2
Clear Floor Space for Water Closet in a Residence



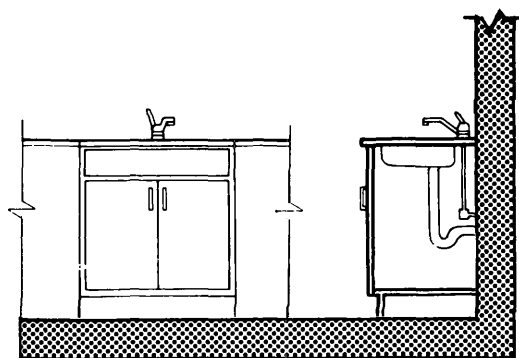
(a) Before Removal of Cabinets and Base

(b) Cabinets and Base Removed and Height Alternatives

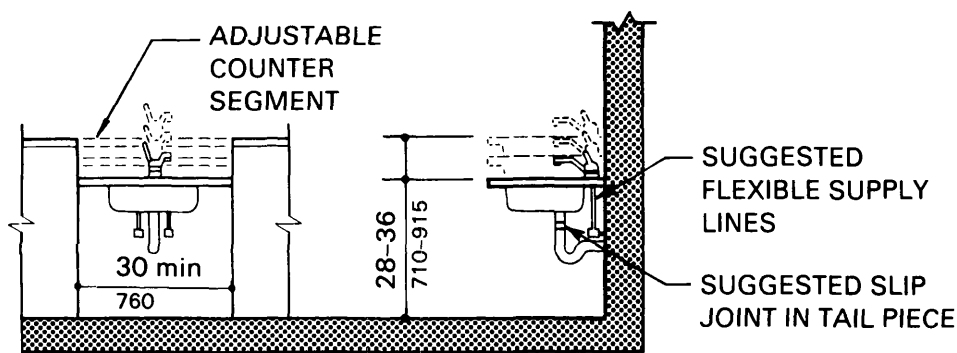


(c) Clear Floor Space under Work Surface

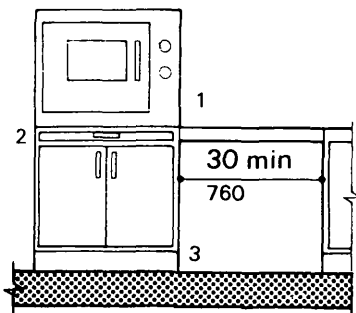
Fig. B4.33.4.4
Counter Work Surface



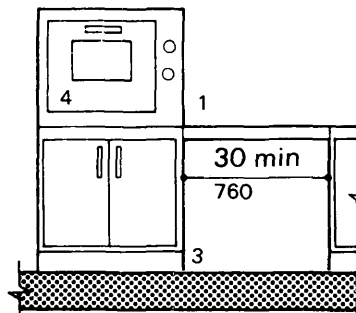
(a) Before Removal of Cabinets and Base



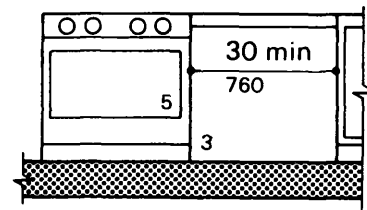
(b) Cabinets and Base Removed and Height Alternatives

Fig. B4.33.4.5
Kitchen Sink

(a) Side-Hinged Door



(b) Bottom-Hinged Door



(c) Range Oven

SYMBOL KEY

- 1. Countertop or wall-mounted oven
- 2. Pull-out board preferred with side-opening door
- 3. Clear open space
- 4. Bottom-hinged door
- 5. Range oven

Fig. B4.33.4.7
Ovens without Self-Cleaning Feature

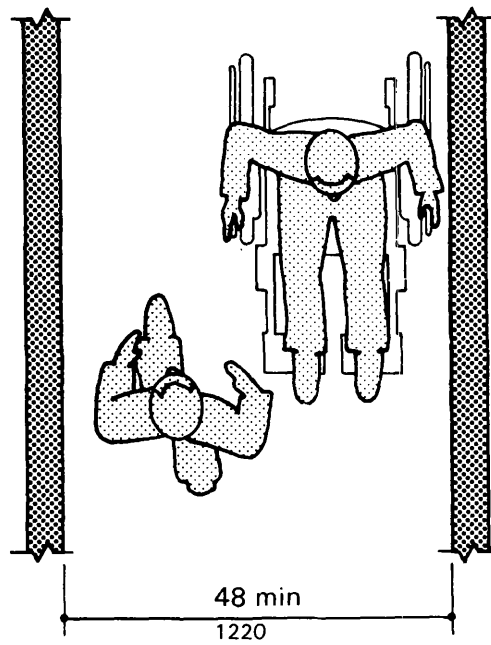


Fig. BA4.2.1
Minimum Passage Width for One Wheelchair
and One Ambulatory Person

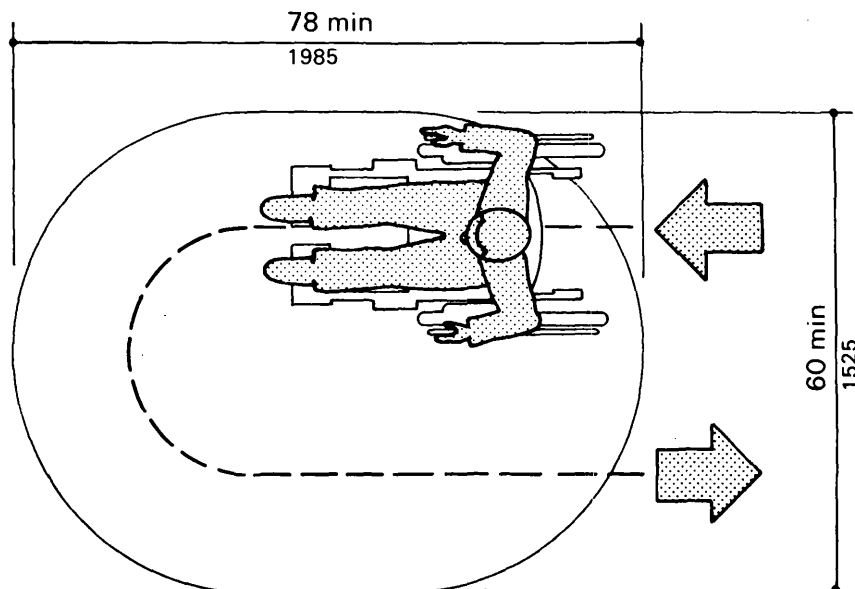
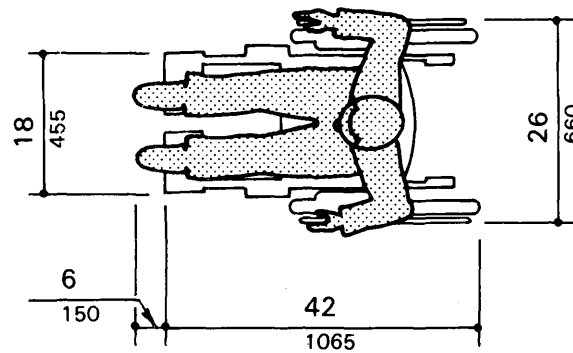
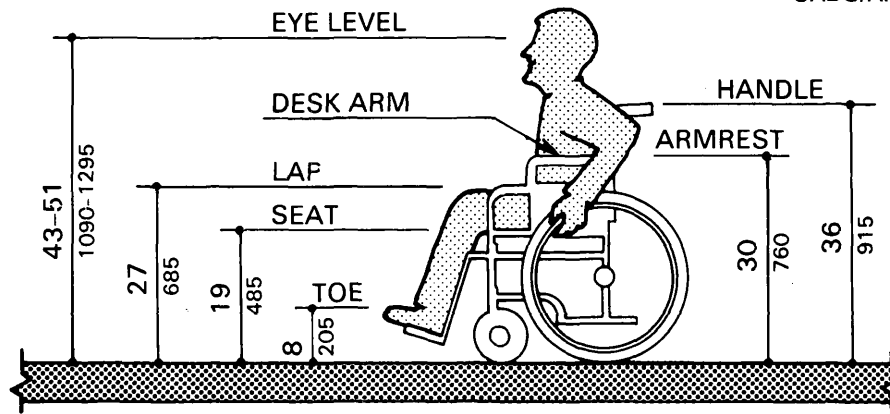


Fig. BA4.2.3
Space Needed for Smooth U-Turn in a Wheelchair



NOTE: Footrests may extend further for very large people.

Fig. BA4.2.4
Dimensions of Adult-Sized Wheelchairs

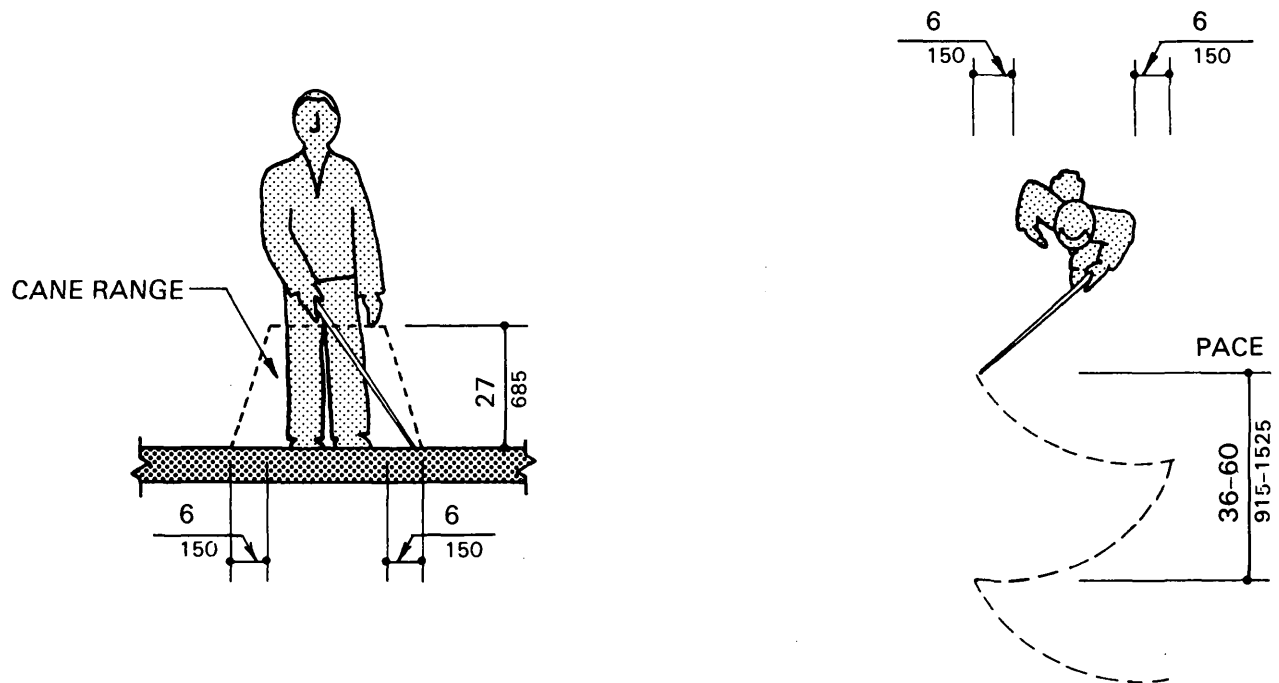
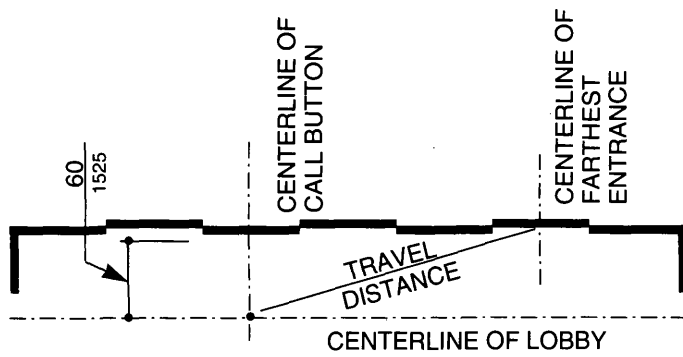
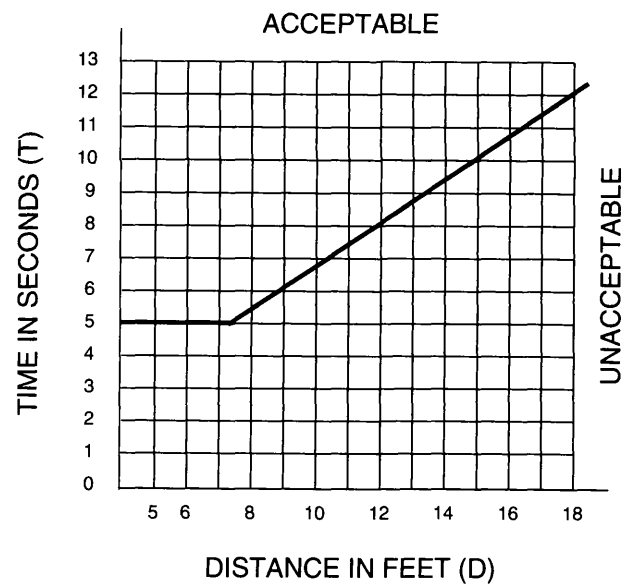


Fig. BA4.4
Cane Technique



Travel Distance		Time
ft	m	s
0-7.5	0-2.3	5
10	3	7
15	4.5	10
20	6	13

(a) Travel Distance



(b) Graph of Notification Time

Fig. BA 4.10.1.7
Timing Equation

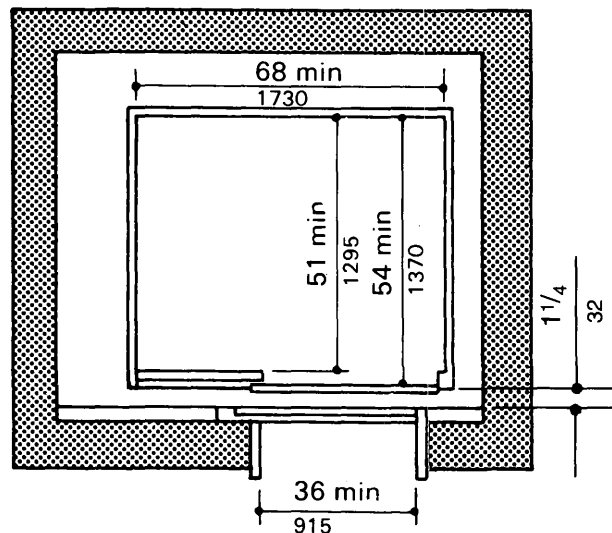
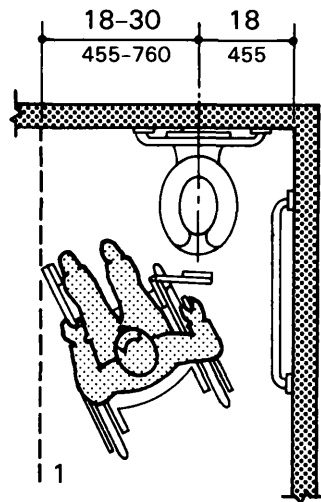
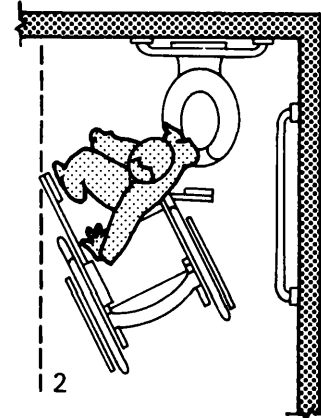


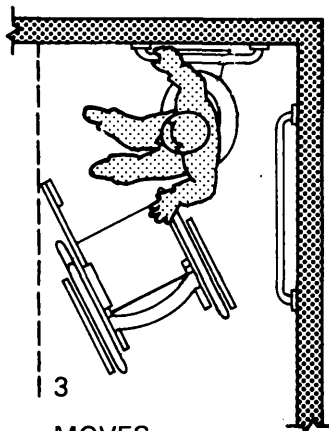
Fig. BA4.10.1.9
Example of Elevator Car Dimensions



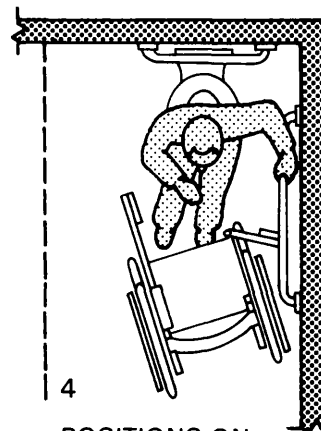
1
TAKES TRANSFER
POSITION, SWINGS
FOOTREST OUT OF
THE WAY, SETS
BRAKES



2
REMOVES
ARMREST,
TRANSFERS



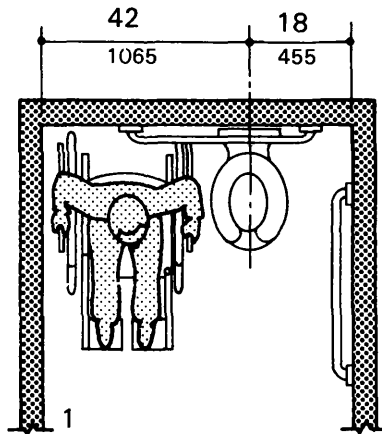
3
MOVES
WHEELCHAIR OUT
OF THE WAY,
CHANGES
POSITION (SOME
PEOPLE FOLD
CHAIR OR PIVOT IT
90° TO THE TOILET)



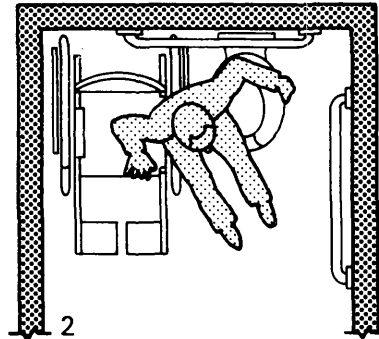
4
POSITIONS ON
TOILET, RELEASES
BRAKE

(a) *Diagonal Approach*

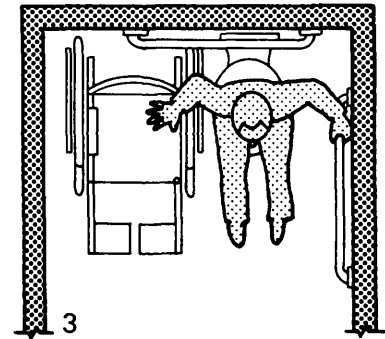
Fig. BA4.17.4
Wheelchair Transfers



TAKES TRANSFER POSITION,
REMOVES ARMREST, SETS BRAKES



TRANSFERS



POSITIONS ON TOILET

(b) *Side Approach*

Fig. BA4.17.4
Wheelchair Transfers (continued)

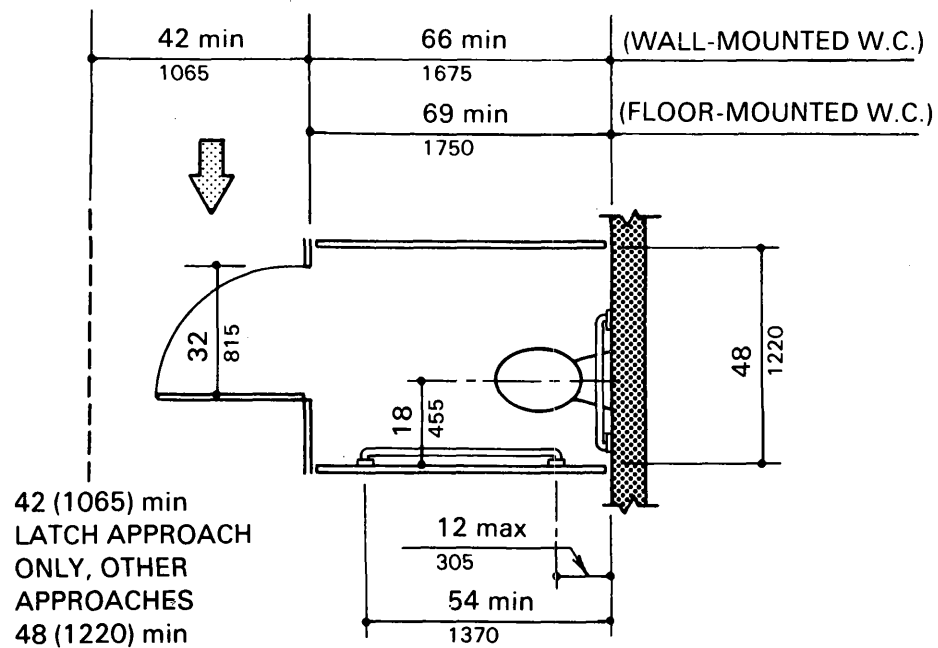


Fig. BA4.18.3
Alternate Wheelchair Accessible Stall

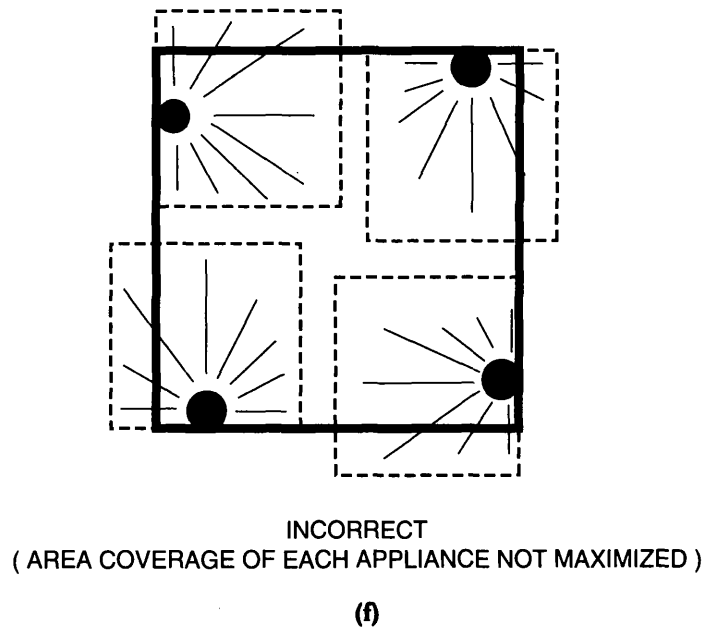
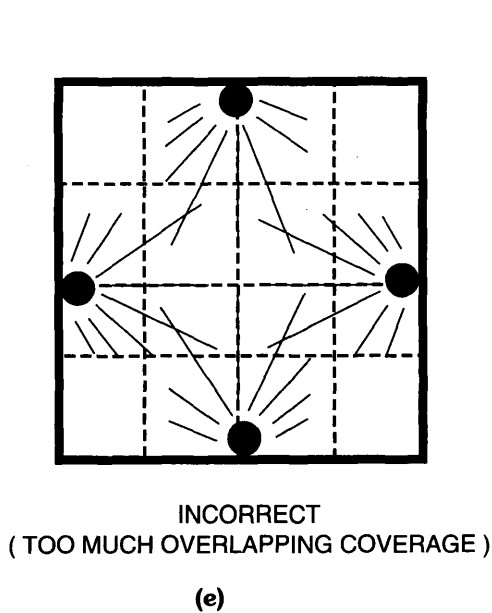
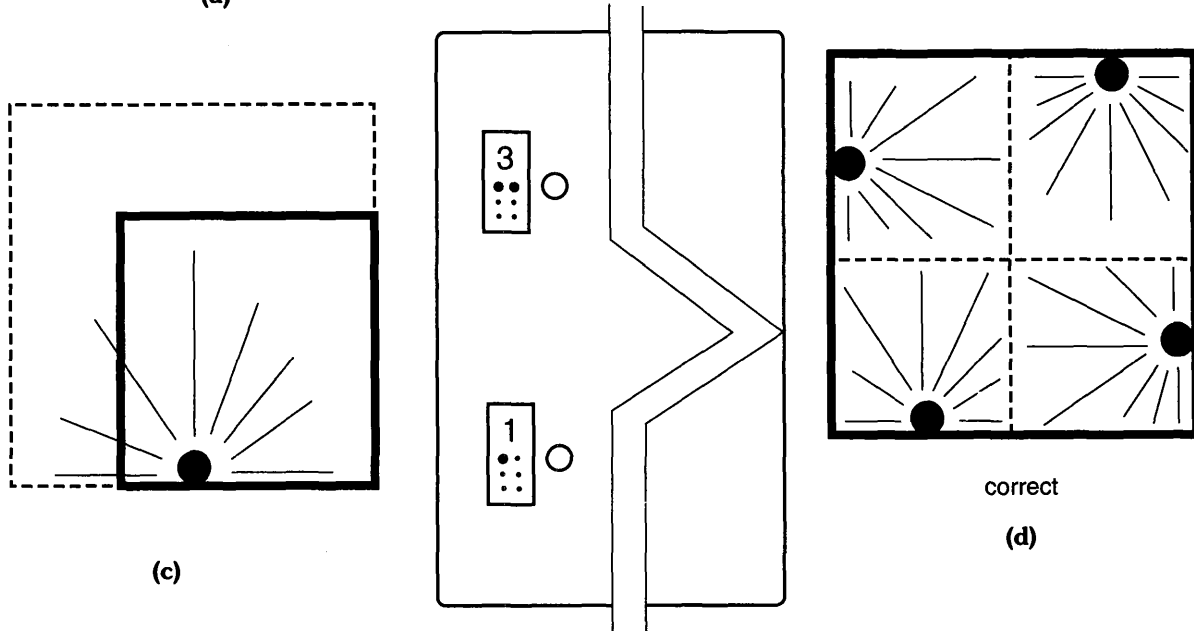
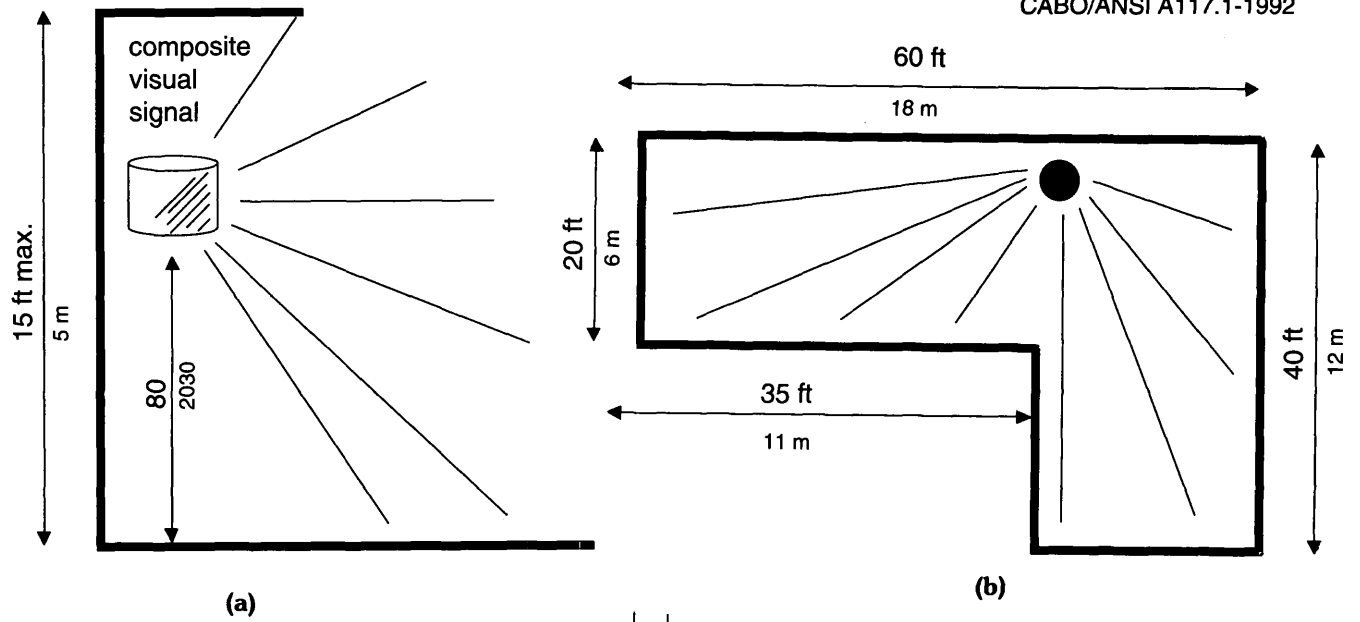


Fig. BA4.26.3
Examples of Visible Signal Appliance Placement

